

The AUTOMOBILE

Why the 1916 Cars Are Cheaper

New Models Better Than Old Despite Price Reductions—Cleaner Design, Better Manufacturing and Lower Labor Costs Offset Rising Price of Materials

By A. Ludlow Clayden

MANY a motorist noticing the 1916 prices and specifications for automobiles is prone to wonder how it is done. Is the new car at a 20 per cent lower price as good as the old one? Has the quality been cut? These are the questions that naturally arise in the mind of a close observer of the 1916 trend.

It is possible to answer that never before has the value for money offered to the motorist approached the pinnacle upon which it now rests. The reason why is that the automobile industry has only just reached maturity. To make a human analogy, the youthful trade has passed through childhood, through school and college, has made its first essays in the world of trade. It has just, and only just, completed its period of probation; after twenty years of preparation it has commenced in business for itself and proved its right to take a man's place in world commerce. Now, just as the father has to pay for the education and the capitalization of his son's first essay in life, so has the public had to father the young automobile industry. Of the money paid for automobiles by the users thereof, much went to the education of the industry and much more to the equipment; to the building of factories, the buying of tools.

Expenses Decrease

Of course in every trade something of the price paid by the consumer goes to the maintenance of equipment, to its expansion and improvement, but a new trade that is coming

into being demands far more of its supporters than does an old business. The automobile industry is just shaking off the shackles of development that have bound it and is settling down into a form which it will probably retain for many years. Its future expansion will be less rapid than that of the past ten years, and thus we find the *expenses* of the industry as a whole are decreasing as the output increases and so the load the consumer has to carry is lessening every year.

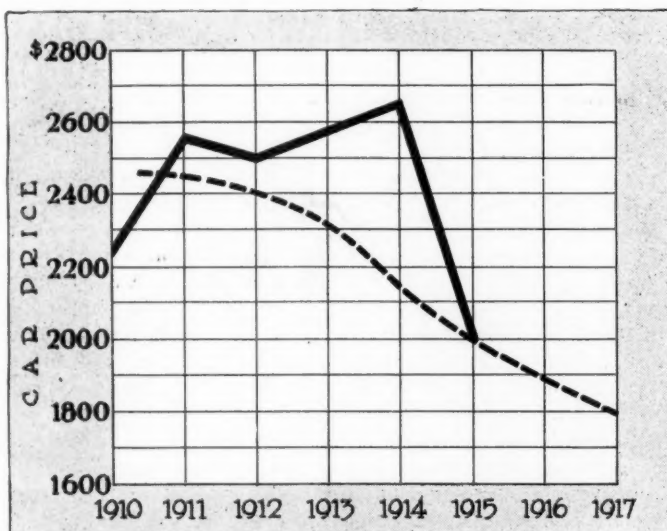
Examination in Detail

It is possible to explain the cheapening of automobiles much more accurately by a detail study of conditions although it is rarely possible to quote actual figures. First it should be explained that in splitting up the cost of a car into items it makes no difference whether the car be made throughout in one plant or assembled from parts made by specialists. The effect of the latter system is to spread overhead charges over several separate firms instead of over several departments of the same firm, but the general effect insofar as it concerns the consumer is the same in either case.

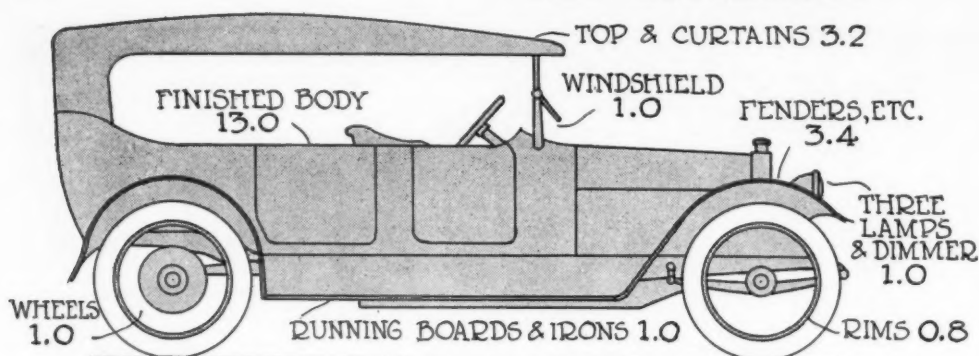
Cost of an automobile is made up from:

Material, including steel, other metals, wood, leather, rubber, paint, etc.

Labor, machinists, assemblers, tool makers, body builders, coppersmiths, etc., and the labor of the factory organization such as cost department, stockroom clerks, etc.

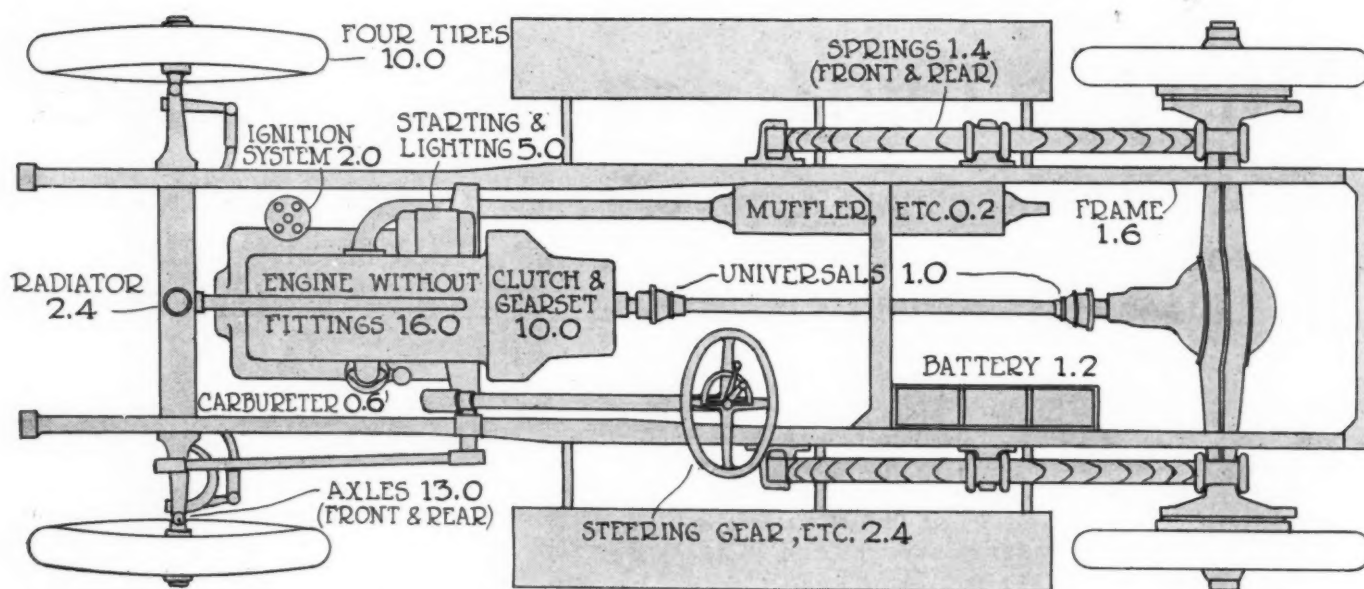


Average price of American cars January 1 of each year. The full line shows actual averages from 1910 till 1915 and the dotted line represents an even downward progress from January, 1911. It cuts out the starter period with its accompanying price changes



OTHER PARTS	
SPEEDOMETER	1.0
MATS & CARPET	0.4
FORGINGS, RODS, ETC.	1.0
STEEL CASTINGS	1.6
TOOLS & JACK	0.4
HORN & BUTTON	0.2
OTHER SUNDRIES	0.2

LABOR	
PAINTING CHASSIS	1.0
ASSEMBLING & FITTING	3.0



This drawing shows in graphical form the approximate relative prices of the different components of an automobile chassis. These represent the percentage costs of the components purchased by an assembly firm, or the department costs of a complete factory with the overhead split up. The prices do not include anything for overhead on the assembling plant or the assembling portion of the factory. Necessarily the figures represent broad averages only and are not derived from one special job.

Overhead Labor. Engineers, salesmen, managers of departments, etc.

Capital investment in plant, machinery, etc.

Net Profit. The difference between all the above added up and the selling price.

Materials Cheaper and Dearer

The materials used in an automobile of 1916 cost less than before on the average, despite the fact that nearly all materials are more expensive. This apparently contradictory condition of affairs has been brought about by various causes, the main things being that materials are better chosen and better proportioned. Taking the case of steel, the price of common qualities from which the better qualities are made fluctuates all the time and whether it is up or down just now depends upon how far back one goes for the comparison. Steel is cheaper for many automobile parts because of the work of the Society of Automobile Engineers, and because of advances in design.

Not so long ago the steel used for automobile parts was largely a mystery, it was sold under fancy names like soaps or patent medicines. Each maker cried his special brand and a tremendous jargon of largely meaningless words was built up, shrouding the alloy steel business with a cloak of mystery. The S. A. E. steel standardization has made free to all the world the knowledge that steels made to definite formulæ have definite properties and that there is no mystery about it. The S. A. E. specifications enable a manufacturer

to get competitive quotations for the same steel from all sorts of sources. He no longer has to worry with the names of fancy brands.

The effect is that steels are being used for many automobile parts which are just as good as those of four or five years ago and cost anything up to 5 cents a pound less. Nor is competition alone the cause of this for the simpler alloy steels have been found to be not so terribly hard to make. Some steels which used to be considered a crucible job have been produced by the open hearth process in excellent quality. More electrical refinement has enabled economies to be made, so that the rise in price of pig that has occurred in the last year has not been enough to offset the economies of the past three or four years. Of course, this cannot last forever, and there are indications that next year may see a real steel shortage which will boost prices on all qualities, but even if this does happen it will be but temporary. It is the downward tendency of price due to better steel making and better usage that has enabled the 1916 automobile to be built so cheaply.

Design Economizes Material

As an example of the way in which design is helping, the crankshaft may be taken. Not long ago it was thought best to make this of expensive steel which was hard and difficult to machine, but now we have found that vibration can be eliminated only by the use of much larger shafts than is demanded by consideration of strength only. So crankshafts

of 1916 are made of cheaper qualities that are easy to handle in heat treatment and in machine shop and still make a better job. To use high tensile alloy steel for a modern 2½ in. crankshaft is rather like employing a steam hammer to break eggs; quite efficient but rather absurd.

Look, too, at what has disappeared. Look at the clean and simple chassis of to-day and think of the rods, tubes, pressings, links and brackets, castings, forgings, rollings, etc., that have vanished from the automobile and you see not only saved material but saved work. Before leaving materials, however, it should be added that three important metals are now high in price, these being aluminum, zinc and copper. Lead and tin, too, are up in price, so that brass parts have become costly. Very well, go carefully over an automobile of 1916 and see how much brass is to be discovered. Take off the switch from the dashboard and you will find the flange plate is enameled steel, just as strong and many times as cheap as the brass that would have been used till lately. No quality worth having is missing but off come several cents from the price. Look at the motor, where are the brass and copper water pipes, the heavy brass nuts and levers and handles. All gone and replaced by lighter, better steel forgings and stampings, all much lower in price.

Come to the body. Comment on the better appearance of the smooth side includes the improvement caused partly by the absence of the big brass handles that used to decorate each door. Somewhere inside the door is a simpler, neater and more efficient little catch of a quarter the weight and twentieth the cost. Try the hub caps. They have become a light stamped part instead of a massive casting, just as effective for keeping in oil and excluding dirt and cheaper in material and in labor, all being factors which make for a lower manufacturing cost.

Take the radiator. Brass is very expensive, but this did not cause the one-piece construction to be dropped in favor of the enameled steel shell with the brass or copper radiator proper suspended within it. The steel shell makes the

Percentage Cost of Chassis Parts and Body

NOTE—All figures are expressed in percentage of factory cost less selling cost, etc. They apply well to cars costing retail from \$650 to \$1,250, but the proportional cost of motor and body rises a little as the price increases. The figures given are a broad average.

Part of Car	Per Cent Total Car Cost
Radiator	2.4
Engine Without Fittings	16.0
Clutch and Gearset	10.0
Carburetor	0.6
Ignition System	2.0
Starting and Lighting	5.0
Battery	1.2
Front and Rear Axles	13.0
Wheels	1.0
Rims with Spare	0.8
Four Tires	10.0
Springs	1.4
Finished Body	13.0
Top and Curtains	3.2
Windshield	1.0
Speedometer	1.0
Fenders, Etc.	3.4
Running Boards and Irons	1.0
Three Lamps and Dimmer	1.0
Mats and Carpet	0.4
Steering Gear, Etc.	2.4
Frame	1.6
Forgings, Rods, Etc.	1.0
Steel Castings	1.6
Muffler, Etc.	0.2
Tools and Jack	0.4
Horn and Button	0.2
Universals	1.0
Other Sundries	0.2
Labor	Per Cent
Painting Chassis	1.0
Assembling and Testing	3.0
TOTAL	100.0

radiator a better appearing job, and a more durable and stronger part, while it saves brass, the expensive labor of the coppersmith and some time also in the chassis assembly and paint shops.

Summing up, there is *less* metal in the 1916 automobile. It is used in *simpler* forms. In a word there is *less waste*.

Cutting the Labor Cost

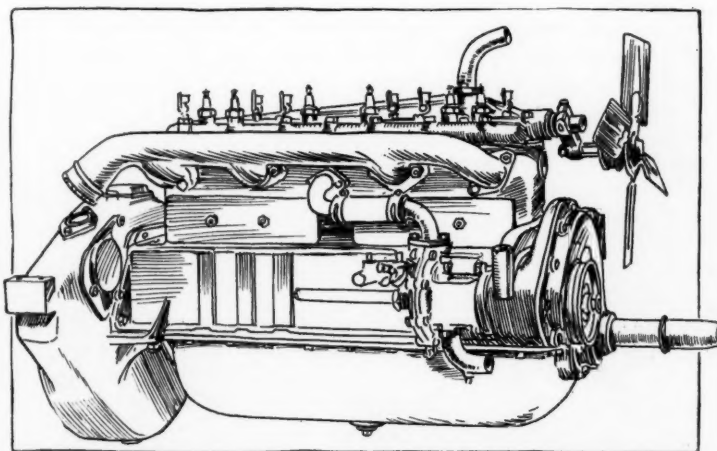
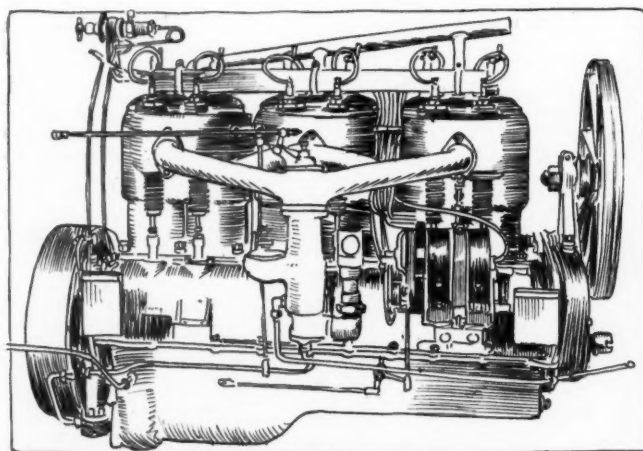
Better manufacturing has been the cry for three years past in almost every automobile plant. The automobile trade was just getting down to production when the self-starter upset everything. Having recovered from that disruption, having made the once troublesome accessory an integral part of the car, evolution has resumed a normal progress. Naturally manufacturers will not give definite figures for definite parts, the matter is too vital to the business, but it is safe to say that the average cost of producing a motor, an axle or some such unit assembly has dropped anything from 20 to 50 per cent on labor alone.

Why? Well, look at a motor of 1913 and a motor of 1916 side by side. Which looks as though there was most to do on it? A block motor eliminates the making of manifolds for gas and water, of casting, machining and fitting those manifolds. It eliminates

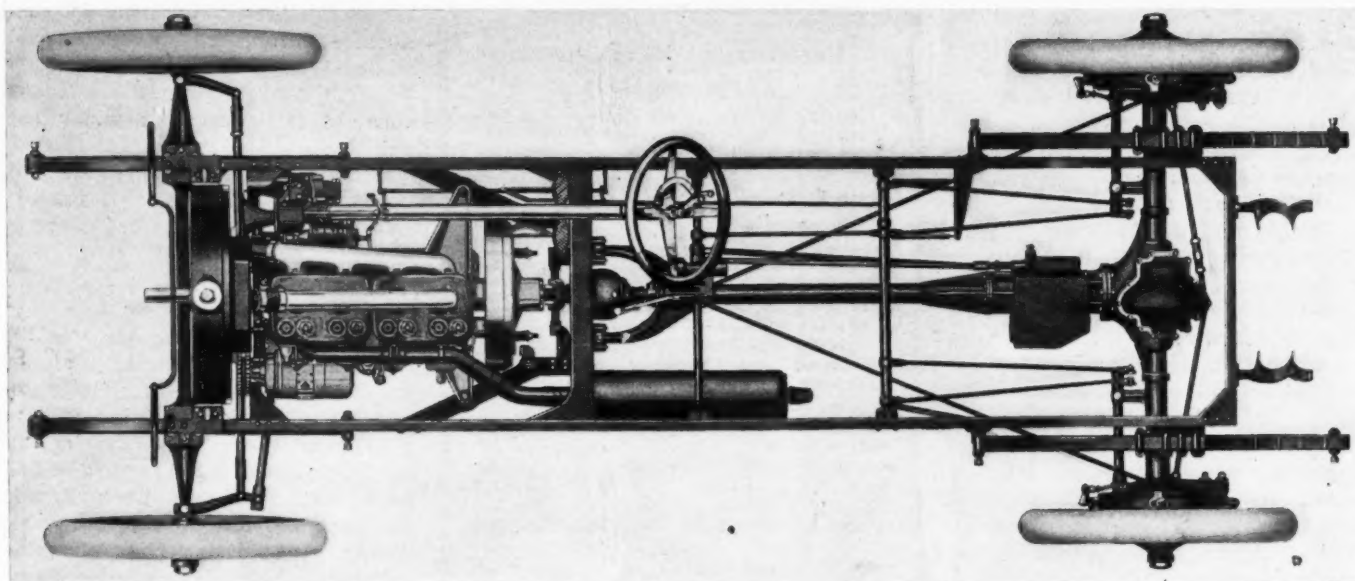
two or three holding-down bolts and the manipulation thereof. Oilways cast integrally with the crankcase save copper pipe, the cutting, nipple fitting, testing and attaching of the pipes. The detachable cylinder head simplifies the casting, the machining, the valve fitting. It dispenses with valve caps, their machining and fitting and renders the motor assembly easier, in addition to rendering it much more accessible, thus benefiting the car owner.

The Simple Power Plant

Go to something bigger and take the unit power plant. Here we have, no lining up of one part with another, three points of frame attachment instead of six or eight, no clutch coupling shaft, one part to be handled instead of three, and



A typical engine of 1912 on the left and 1916 on the right. Notice the great simplicity of the modern design that cuts out many details that used to need separate machining



A typical chassis of 1912. Compare it with the chassis illustrated on the opposite page, one of the 1916 low-priced sixes

usually the elimination of two or three frame members, their making and attaching. Take the rear axle, spiral bevels eliminate the noise trouble to a great extent, they allow the axle to be brought to perfection with less time on adjustment. The axle case is commonly simpler in design with fewer parts. Take the brakes, having the pedal and the emergency lever on the power plant has done away with several frame attachments, has eliminated another lining up job. Finally look at the fenders and running boards; they look better, the domed fender is handsome, the graceful curve pleases the eye and also helps to make the fender more effective as a mud catcher, but look closer and you may notice that one piece of sheet steel, formed at one squeeze of a giant die has replaced a dozen strips of metal with bolts and rivets and screws which enabled the old style fender to be built up by one hand process after another. Bump comes the die, obedient to the hand of one man and as much work is done in a couple of seconds as was previously performed by half a dozen skilled men in an hour. Again a *better* article for a fraction of the cost.

There is no need to elaborate the picture further, enough has been said to indicate a line of thought that any man can follow for himself, but it is things like this that make up better manufacturing.

Capital and Labor Compromises

Now to look at another aspect of the labor question: We are led to that of capital investment. Too hurried an expenditure on plant piles up a debt that the efficient working of the machines cannot pay off within a reasonable time, but every time one machine is used that could be replaced by another to do better work there is waste going on. Suppose \$3,000 will buy a fairly efficient machine for making some special part, and the best possible machine costs \$9,000, as may easily happen. Then it becomes a point to decide whether the saving on the work of the more expensive tool will be enough to compensate for the heavy capital charge. Very often indeed the poorer tool is the better, figuring on a schedule of a couple of years output. This is simple horse sense and most automobile manufacturing concerns have gone slowly in the purchase of costly tools, starting in business with fairly good equipment and improving it as earned money gave them funds to spend. This is especially true of the big firms which form the backbone of the trade.

Economical, Efficient Painting

To give an example, many of these firms have installed during the summer, a new body finishing scheme. Here the

body is passed through a sort of tunnel which is so heated that the paint dries in a much shorter time, so clearing the floor space more rapidly and easing the handling, as it reduces the number of half-finished bodies in the various operating rooms. This saves time, which is money, produces just as good work, even better some say, but the equipment is costly and it is only lately that the steadiness of large demand has made the outlay allowable.

Another thing of vast importance is the air brush painting system which does better painting in vastly less time and with less waste of paint. Mounted on a revolving stand six four-cylinder block castings can be air brush painted in 2 min. by one operator working carefully. Try looking at a cylinder block and think out how long it would take to paint it with a brush so as to give a perfectly even surface. Modern bodies have few beadings and few angles, which makes painting and rubbing down much easier and quicker. Upholstery does not roll over the edges of the panels but stops flush. So much the easier for the workman, for a metal bead and a leather strap vanish, the upper edge of the body is finished by the die that presses the panel instead of by the hand of the tack-hammer welder.

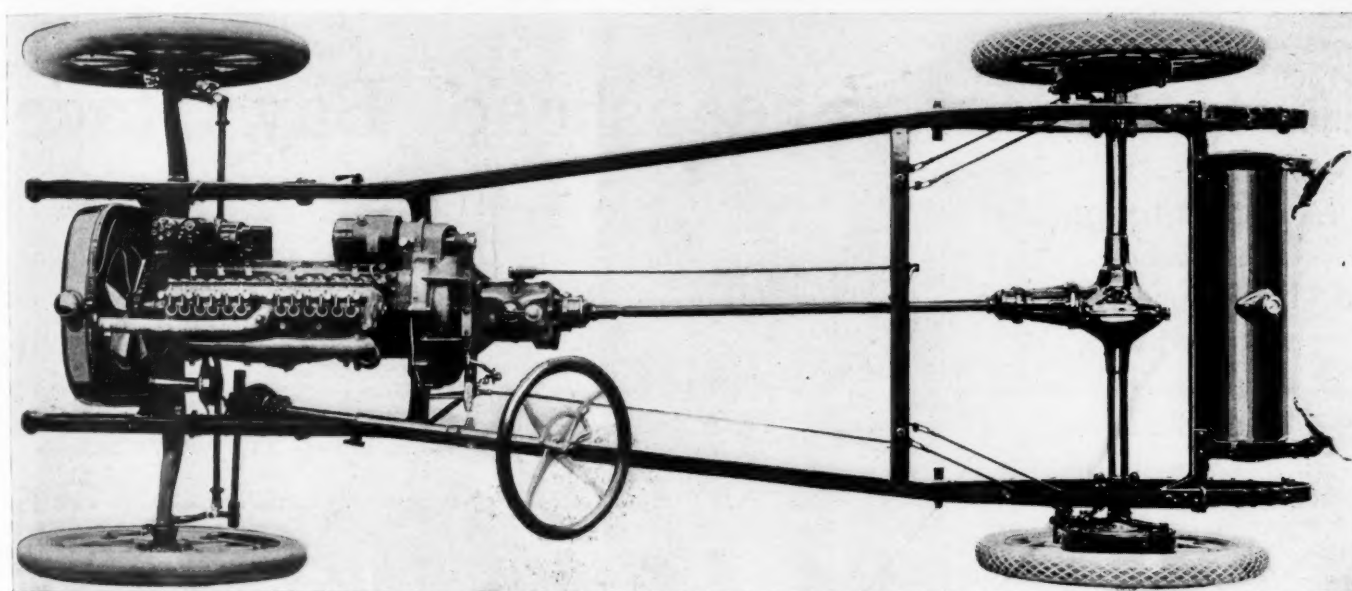
Saving the Profits

Big machine tools, new process equipment, such as the paint shop outfits just described, factory rail tracks and chain conveyors, all sorts of things to lessen labor in making and labor in handling are the things the automobile firms have spent a large part of their profits on during the past few years. Suppose the profit in 1913 were \$200 per car, very likely half or more went to but equipment that would cut the factory cost, but we have now reached a stage where much of this equipment is bought and paid for. It is no longer a charge on the profits of the company, so in making at the old price they would be making double profit. Having the better plant, having the facilities for larger scale manufacture, it is better commercially to drop the price to the user, to take a smaller gross profit per car, sell a few more cars and have at least as much net profit at the year's end. In other words, the user is getting the benefit of the tools and equipment he has helped to pay for during years past.

Per Cent Cost of Components

The table of costs of different parts of an automobile figured in percentages and shown on page 595 is an interesting subject for analysis. Taking the items there given we find the following:

Radiator—Price about the same as improved methods of



Typical 1916 chassis. Note the simplicity of this design as compared with the 1912 chassis on the opposite page. Note how many parts have been eliminated

design and construction offset increased cost of materials. Labor especially is cut by use of loose steel shell so that the radiator actually fitted to the chassis may sometimes be a few per cent cheaper.

Power Plant—Materials are iron which is dearer, steel which is cheaper, aluminum and brass which are dearer. Labor is down anything up to 50 per cent on new designs by virtue of improved manufacturing. Thus motor and gearset cost anything from the same as last year to 40 per cent less according to how much the design and the making have been improved.

Ignition, Starting and Lighting—All material a little more expensive, but improved design gets the same effect with less wire and can save a few per cent on total cost. Elimination of waste material, especially brass, increased use of stampings and decrease of total weight have caused a considerable economy, probably up to 30 per cent.

Battery—This is one of the few parts of a car that have sometimes been cut in quality a little, but it is cheaper mainly by virtue of the fact that the battery makers have got into shape to meet the demands of a new field for their wares.

Axles, Springs and Wheels—Very slightly cheaper, from 0 to about 5 per cent. Mostly accounted for by increased quantities coming from each plant.

Tires—Approximately 15 per cent cheaper because of larger quantities, fewer sizes and better manufacturing.

Body—From 0 to 50 per cent cheaper. Savings made by simplified design, cheaper upholstery material instead of leather, cheaper quality of leather, more springs, less hair in stuffing. Greatest saving obtained by new finishing systems now in process of development, that save large proportion of labor.

Body Fittings—Cheaper by elimination of heavy brass parts, etc. Saving impossible to estimate accurately as this tendency has spread over several years.

Accessories—From 5 to 25 per cent cheaper by virtue of simplified construction and elimination of such parts as side lamps.

Steering Gear—Cheaper from 0 to about 5 per cent on account of larger orders. By comparison with several years ago, cheaper by simplified design perhaps nearly 50 per cent in some instances.

Frame, Forgings, Castings and Raw or Semi-Raw Materials—Mostly slightly more expensive than last year. These are common steels and feel fluctuations of steel market.

Of course these percentages do not represent the truth

concerning every car. They are simply broad averages and the figures are deduced from confidential information gathered from all sorts of sources. Some cars which have had their price cut are costing just as much to make now as ever they did and the cut represents nothing but less profit for the manufacturer; but these instances are rare.

Normal Price Reduction 13 Per Cent

After all, has the cutting of price been so very large? Remember that a cut is only a true cut when the car as a whole remains much the same. A new design like the Oakland little six for example is not a cut for it is a new Oakland in every respect.

Take twenty cars and examine what has happened to them.

Car	1915 Price	1916 Price	Per Cent Cut
1. Briscoe 4.....	\$785	\$750	4.5
2. Buick Big 6.....	1,650	1,450	12.0
3. Cadillac 8.....	1,975	2,080	plus 4.8
4. Chalmers 6-40.....	1,400	1,275	9.0
5. Franklin 6.....	2,150	1,900	11.6
6. Hupp 4.....	1,200	1,085	9.6
7. Hudson Light 6.....	1,550	1,350	13.0
8. Imperial 4.....	1,085	995	8.3
9. Interstate 4.....	1,000	850	6.6
10. Jeffery 4.....	1,550	1,000	35.0*
11. Marmon 6.....	3,250	3,250	0.0
12. Maxwell 4.....	725	635	12.4
13. Mitchell 6.....	1,555	1,250	19.6
14. National 6.....	2,375	1,690	29.0
15. Oldsmobile 4.....	1,285	1,095	14.8
16. Oakland 4.....	1,150	1,050	8.7
17. Overland 4.....	1,075	725	32.5
18. Regal 4.....	1,085	985	9.2
19. Stearns 4.....	1,750	1,395	22.0
20. Studebaker 4.....	985	850	13.7

*This car is a new design to a greater extent than most of the others.

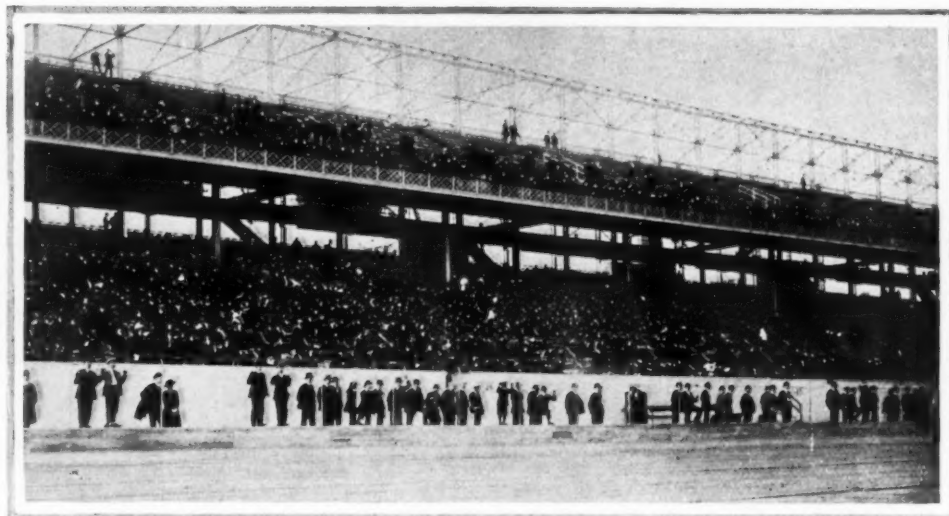
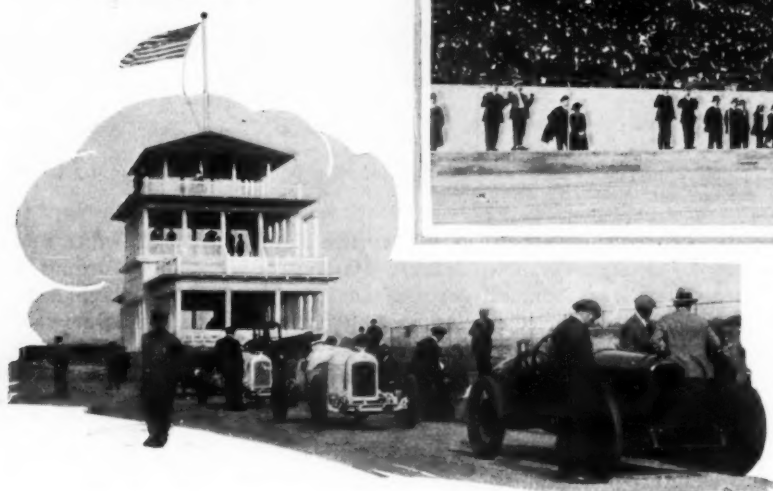
The average decrease in price for these twenty cars selected at random, is 13.3 per cent.

Now a drop of 13 per cent is perfectly explainable on the basis of better design and better manufacture. As enlarged upon in the previous pages, it is nothing to cause either question or alarm and it is merely a natural manufacturing development. In 1914 the average price of an automobile reached its zenith and there is no doubt that the price was forced up by the coming of the starter which was then hardly the integral part of the car it has since become. The starter cost a good deal to buy and much more by reason of the disorganization of design and assembly methods which were just settling down in 1912. The automobile would have come to its maturity sooner had the upheaval of the electrical equipment not come along quite so soon. Take the curve

(Continued on page 607)

16 Cars for Sheepshead Bay Race

Original Entry of 30
Reduced
to This Figure by Un-
preparedness,
Lack of Drivers and
Accidents



Above—View of the grandstand at the Sheepshead Bay motor speedway during the elimination trials. If the grandstand is entirely sold out for the race, it will bring \$198,000

Left—in the foreground is one of the Peugeots, with two Stutzes in the rear lined up at the side of the track during the elimination trials

Speeds Made in Elimination Trials

Car.	Driver	Time	M.P.H.
Peugeot	Resta	1:08.2	106
Peugeot	Aitken	1:08.65	105
Peugeot	Burman	1:09.78	103
Delage	Oldfield	1:10.07	102.75
Stutz	Anderson	1:10.84	102
Stutz	Rooney	1:10.93	102
Peugeot	Wilcox	1:11.0	101.5
Stutz	Cooper	1:11.80	100.5
Maxwell	Unknown*	1:11.56	100
Duesenberg	O'Donnell	1:12	100
Maxwell	Rickenbacher	1:12.72	100
Mulford Special	Vail	1:16.5	94
Sebring	Haibe	1:19.29	91
Duesenberg	Haupt	1:20.05	90

*Qualified by Rickenbacher.

NEW YORK CITY, Sept. 28—Sixteen cars will start in the 350-mile race on the Sheepshead Bay Speedway on Saturday, Oct. 2, the original entry of thirty being reduced to this figure by some not being in running condition, others withdrawn for lack of drivers, and others eliminated due to accidents. The latest of these was the Maxwell, driven by Harry Grant, which took fire in Monday's practise when Grant was severely although not fatally burned, and the car badly damaged. The Mercers are out on account of lubrication trouble. The Peugeot which Ralph Mulford was to have driven is not ready. It will be impos-

sible to get the Delage, entered by Harry S. Harkness, president of the speedway, ready in time. Other withdrawals are Bugatti, Sunbeam and one of the Stutz entries. It is uncertain whether the Erwin specials, generally known as the Bergdolls, will appear or not. Of course, there are a number of drivers who have not yet made their elimination trials so that the final list cannot be determined.

Hold Speed in Reserve

Elimination trials to determine the order of starting in Saturday's race are progressing slowly, thirteen cars having taken their trials the first two days. The trials will be continued to-day and to-morrow. So far none of the cars have had difficulty in setting an average of over 85 m.p.h. Resta's Peugeot holds the track record in these trials at 106 m.p.h. Higher speeds are possible but all drivers are holding themselves more or less in reserve.

Curved Bank Increases Distance

It is not certain whether elimination trials will be as fast as on the Chicago speedway, due to the fact that with the parabola banking, the drivers are forced to drive wider and higher on the track than they did at Chicago, where the straight banking is used. It has been calculated that in a lap of the 2-mile speedway here, a car travels 197 ft. further when averaging 100 m.p.h. This is equivalent to 1 3/5 sec. per lap, which equals about 4 m.p.h. On the Chicago track with its straight banking it was possible to make as high speeds close to the inner edge of the track as high on the banking.

Easy on Tires

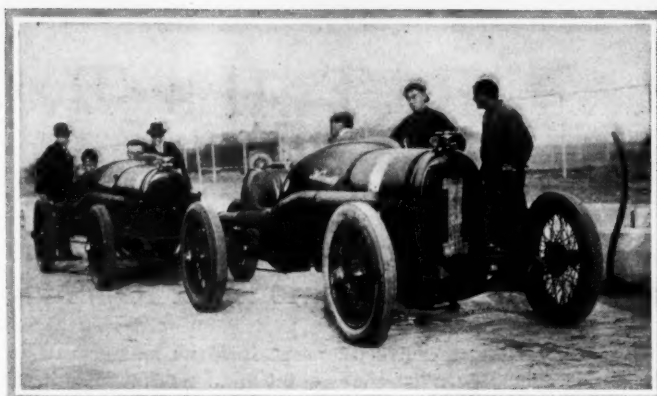
In practise the cars are running high on the steepest part of the curves at each end of the speedway, these curves being well banked on the surface. With the cars traveling at approximately 100 m.p.h. there is no tendency to skid but

rather the rear wheels tend to slide toward the inside of the track, indicating that the track is intended for considerably higher speeds than the cars are able to make. Because of this situation, the drivers believe that the track will be easier on tires than the Chicago one, where there is a tendency for the rear wheels to skid toward the outside of the track at speeds of 102 m.p.h. and over. It is estimated that on the New York track this skidding outward will not take place until speeds of 120 m.p.h. or higher are made and perhaps not then.

The track surface is quite black, the wood having been creosoted. This does not make it slippery but has just changed the color. Inside of the track is a broad safety apron which is brick along the home-stretch but hard dirt around the rest of the track. Inside of this safety zone is a cement wall nearly 2 ft. high. Within the wall is a safety zone or neutral space, after which comes the fencing inclosing the infield, where the cars park.

William Schimpf, ex-chairman of the Contest Board of the American Automobile Association, has been chosen referee. The entire speedway is practically completed, the grandstand seating 39,000 was completed in time for Saturday's trials and the bleachers are now completed. The main entrance, at which fourteen rows of automobiles can enter abreast, is finished, the high wire fencing inclosing the reserved parking spaces inside the track is in place, in fact all details with a few minor exceptions are ready.

The Mercer and F. R. P. cars have not yet been on the track except for a few laps, and no gage of their speed possibilities has been obtained. The F. R. P. motor has been redesigned so that there is now a waterjacket between the piston and the inner sleeve, this jacket extending upwards from the base of the cylinder casting. This should result in getting the heat well away from the piston. There



Two Maxwell cars at the side of the track at the elimination trials for the 350-mile race. Note Jack at the right of the illustration, one of the greatest of time-savers in tire changing

Complete List of Possible Starters

Car	Driver
Mercedes	Ralph De Palma
Delage	Barney Oldfield
Stutz	Earle Cooper
Stutz	Gil Anderson
Stutz	Rooney
Peugeot	Dario Resta
Peugeot.....	Bob Burman
Peugeot	John Aitken
Peugeot	Howard Wilcox
Maxwell	E. Rickenbacher
F. R. P.....	Jean Porporato
Duesenberg	E. O'Donnell
Duesenberg	Pete Henderson
Duesenberg	Haupt
Mulford Special.....	Ira Vail
Ogren	Tom Alley
Sebring	Ora Haibe
Pugh Special.....	Jack LeCain

still remains a waterjacket outside of the outer sleeve so that the sleeves reciprocate between waterjackets. The cylinders are 3.88 by 6.125 in. Other details of the car are as they were at Indianapolis.

Record Attendance Expected

The sale of tickets promises to reach \$100,000 before the opening day of the race. If the grandstand is entirely sold out it will bring approximately \$198,000. With good September weather prevailing, it is safe to assume that the attendance will be greater than at any other

speedway race ever held in America.

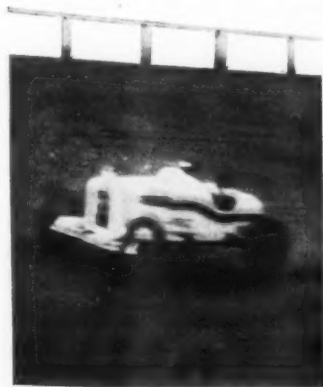
The accident to Harry F. Grant, twice winner of the Vanderbilt Cup race, occurred at the end of the elimination trials Monday, when he was practising on the track with Rickenbacher in the other Maxwell. Grant was traveling at high speed and soon after he passed the grandstand, flames were noticed under the car. By the time he reached the curve the rear end was enshrouded in flames. Grant tried to stop as quickly as possible and skidded fully 200 yd. on the track before he came to a standstill. Fortunately, workmen were at hand and soon extinguished the blaze but not before Grant was very severely burned from the waist downward. It will be several weeks before he will be out of the hospital.

Predict 100 M.P.H.

With good weather conditions prevailing on Saturday it is expected that an average speed of close to 100 m.p.h. will be maintained for the 350 miles. The race starts at 12 o'clock noon, this hour being selected to give out-of-town spectators a good opportunity of reaching the track without having to start before sunrise.

In the practise to-day Burman made a circuit of the 2-mile track at 103 m.p.h., this being the fastest for the day.

A simple way to time the cars is by figuring that it takes exactly 1 min., 12 sec. to circle the track at 100 m.p.h.



Left—Cooper in a Stutz during the elimination trials. Center—Oldfield in a Delage and Aitken in a Peugeot at high speed. Burman is at the left. Right—Grant in the Maxwell

Indiana S. A. E. Talks Twelves and Aluminum

Vigorous Discussion Follows Reading of Papers by J. G. Vincent and James E. Diamond at Opening Session

INDIANAPOLIS, IND., Sept. 25—Last night a crowded meeting of over 350 members and visitors attended the reading of the two papers scheduled for the opening meeting of the winter season of the Indiana section of the Society of Automobile Engineers. The papers presented by J. G. Vincent on the twelve-cylinder engine, and by James E. Diamond on the aluminum piston were published in *THE AUTOMOBILE* last week, Mr. Vincent's paper being identical with that read by him in Detroit on Sept. 16. At the previous meeting O. E. Hunt, chief engineer of the Packard Motor Car Co., read the paper for the author so as to leave him with an untired voice when discussion commenced, and this idea working out well it was repeated at Indianapolis.

A novel detail of procedure was the reading of Mr. Diamond's paper immediately after Mr. Hunt had finished, thus opening the discussion on both papers at once. The scheme worked out extremely well.

Business Report Is Good

The business report was read first and showed the section to be in excellent condition financially, many local manufacturers having given substantial donations to its funds. F. E. Moskovics was in the chair and spoke briefly on the section. He said that J. G. Vincent deserved the greatest possible credit for the way in which his tests on the Indianapolis speedway had been conducted with the utmost freedom and publicity. At Mr. Vincent's invitation other engineers had handled the Packard cars which had been tried out on the track for many days previous. These visitors had returned the compliment with their experimental chassis and it was an honor to belong to a section and to a society that could boast men so broad gaged as these engineers.

Coker F. Clarkson, general manager of the S. A. E., came from New York to attend the meeting and he spoke in similar strain, congratulating the section on its activity and good feeling. He also mentioned the automobile reserve which has been suggested as a matter of vital interest to the army authorities and a fit subject for the S. A. E. to consider. The society has no official action in immediate contemplation, but considers the subject one that ought to be discussed so that various schemes may be thought out. On the suggestion of W. G. Wall it was decided to appoint a small committee to consider the matter.

W. G. Wall Opens Discussion

After the papers had been read the discussion was immediately opened by W. G. Wall, who said:

W. G. Wall, vice-president and chief engineer, National Motor Vehicle Co.:—"I have heard with a great deal of interest Mr. Vincent's paper and also heard him discuss his very remarkable motor. I have seen this motor run and have seen what it will do. I can only say it will accomplish everything and probably more than is advertised for it by his company. I agree with most of the things Mr. Vincent has said. There are a few things, however, with which I differ slightly. I believe I am a little more liberal toward the eight than Mr. Vincent is.

"When we decided to build something which we thought was a more perfect motor than the six-cylinder motor, we

went into the matter rather thoroughly and looked over the eight and saw that it had some advantages. We also saw that it had a number of disadvantages. We saw that the twelve had what we considered a great many more advantages than the eight so our idea was, which we endeavored to do, to extract the virtues of the eight and incorporate them with the many advantages of the twelve.

"We considered one of the troubles and one of the drawbacks of the eight, aside from the fact that the torque could never be the same as the twelve or that the vibration could never be reduced to the same extent as on the twelve, that one of the greatest disadvantages of the eight was the inaccessibility.

"The one trouble was getting to the valves. We found, however, that the eight did have some advantages and one of the principal advantages was the fact that the accessories were located in the center, between the cylinders, in what Mr. Vincent refers to in his paper as the 'valve-alley,' where they were entirely out of harm's way, and where weather and road conditions could not affect them, and in fact, you could go through deep water if necessary without any effect upon your accessories. Therefore, we decided it would be better if we built a twelve to locate the valves on the outside instead of on the inside. We did this and found there were other advantages besides accessibility. One of the things that has come up is the fact that even though aluminum pistons have very little carbon deposit, when you locate the valves on the outside, then loose bits of carbon can escape so that we have a practically carbonless engine.

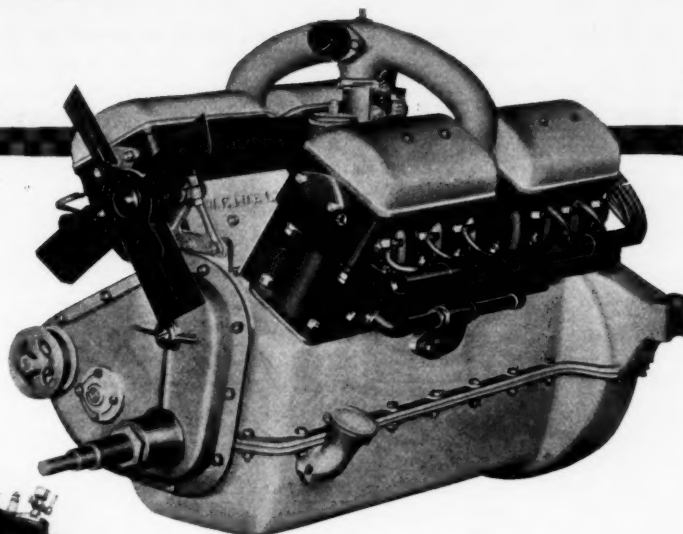
The Friction Factor

"There are several things I wish to ask Mr. Vincent, as he is certainly an authority on twelve-cylinder engines. One of these is his ratio of connecting-rod length to stroke, and another is whether he found any difference in the amount of water and therefore the temperature of the water in the two cylinder blocks, by using the double pump arrangement he has and putting water through the cylinders in multiple. In other words, whether the friction causes any difference. One more point, which is really more technical than of any great interest to the user—what is the horsepower required in driving twelve-cylinder camshafts? Is the horsepower necessary to turn this camshaft increased very materially with the weight of the springs? In other words, you can readily see that in a twelve-cylinder, as one valve lifter goes up the side of the cam, there is always another valve lifter coming down the side of another cam, so that the power required to run a camshaft is really decreased as you increase the number of the cylinders.

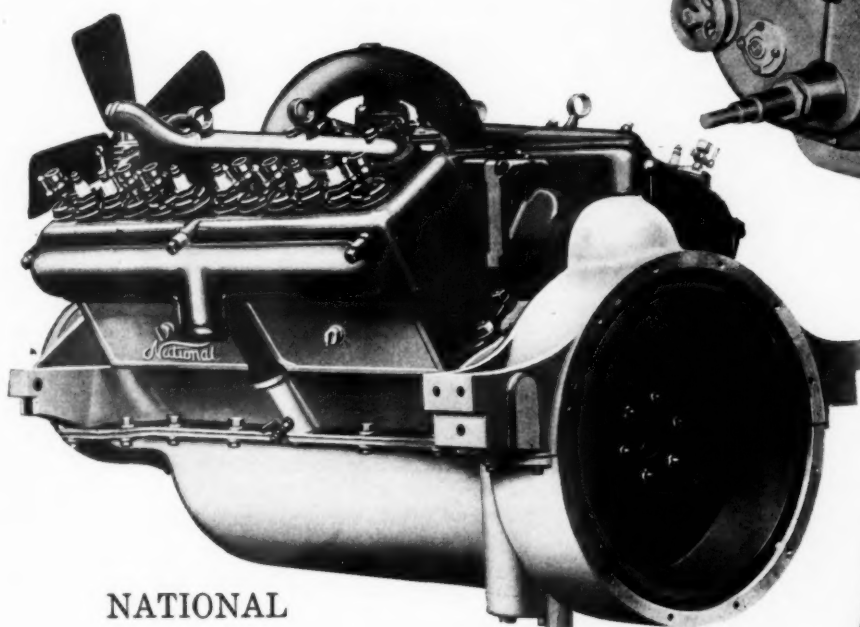
"There is a question I would like to ask Mr. Diamond also, and that is what he finds the difference in the co-efficient of friction between die cast and sand cast pistons."

J. G. Vincent replied that there were certainly advantages in favor of the eight and that he thought all types of engine had their place. All his paper was concerned with was the quite large engine of approximately 424 cu. in. As regards the location of valves, he had considered several types and had wooden patterns made of several designs. The wood pattern is a very useful method of comparison between sug-

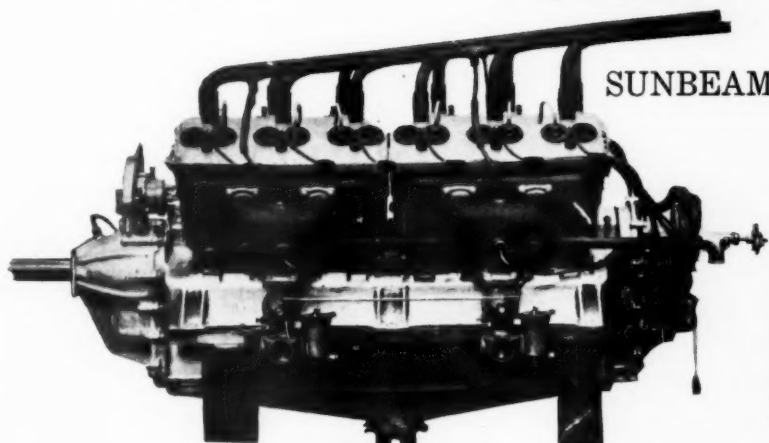
*SOME of
the TWELVES*



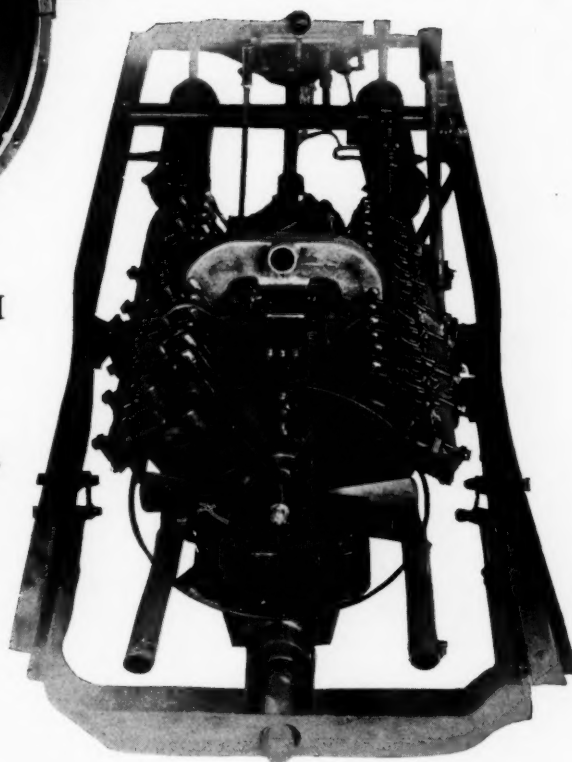
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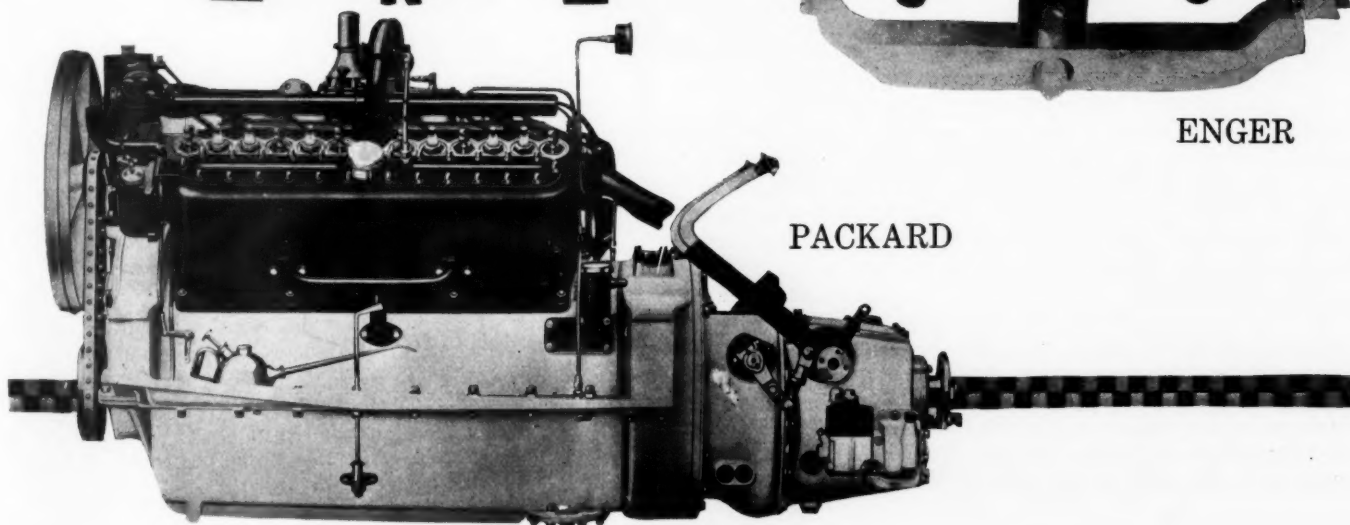
NATIONAL



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PACKARD

gested designs because it is cheap and easy to make in a rough and ready way and gives a real idea of how a motor will look in the chassis. He found the Packard twin six with the valves outside would work out too wide and sit too low in the frame. Also for a motor of the dimensions under consideration the drive layout for the two camshafts, etc., became awkward.

He regretted he could not give the power required to drive the camshaft, but it was easy and light on the chain; he found the chain front end to stand up much better on the twelve than it did on the experimental six of the same total cylinder capacity. The springs used were 60 lb. as compared with 85 lb. on the six. Water temperature varied little, if at all, between the two cylinder blocks and the motor seemed easy to keep cool. Connecting-rod length used on the twin six was 12 in., giving a ratio of 12 to 5 but the length was chosen not so much on account of this proportion as to obtain a good length of valve and valve spring and plenty of bearing on the tappets. He considered the rod to be longer than necessary from the angularity viewpoint.

J. E. Diamond said in reply to W. G. Wall that he could not give comparative coefficients of friction between sand and permanent mold castings but thought the difference would be extremely small.

C. P. Grimes, experimental engineer for Wheeler & Schebler, asked if Mr. Diamond could explain the fact that an aluminum dashpot piston used in a trial carburetor seemed to swell and needed periodical turning down.

J. E. Diamond answered the only possible explanation was that some stress on the aluminum exceeded the elastic limit and so created a permanent set. The only time he had encountered similar trouble was in an aeroplane engine piston and it proved to be owing to the use of too high a compression, causing actual melting to take place.

C. S. Crawford, chief engineer of the Cole Motor Car Co., remarked he has observed several cars standing with the motors idling in the streets of Detroit and the Cadillac eight seemed to run more quietly in this condition than the Packard twin sixes.

Curbstone Quietness Vs. Efficiency

Mr. Vincent: "In this connection there is no question that any type motor can be made to run more quietly when made from an accurate set of tools. The only Packards we have had on the road have been made by hand until recently, when we have been making a few deliveries, and I think any engineer here this evening will bear me out when I say that when boring all new crankcases in a boring mill and depending upon a lathe hand to turn up all pistons and make all parts in this manner, you cannot get the quietness you would get from machine tools.

"It has been my experience that I have never been able to make a motor quiet enough in all its parts to make it absolutely quiet, but in building these experimental cars by hand, I was able to get more quiet results than ever before. There is nothing in absolute quietness. For a long time I have been an advocate of what I call commercial quietness. That is the motor which will go out and give you a ride every day in the week, which will not make the motor evident to the passengers, and not the motor that will give the most quiet demonstration at the curb. I can make any Packard six-cylinder motor absolutely quiet for curbstone idling but it is not practical for anything else, and that is the reason I have set the valve clearances and every other clearance so it can go out and give proper smoothness and the greatest range of ability on the road. The engineering department too many times allows the sales department to get them into trouble by making a motor "curbstone" quiet. It is only a question of the clearances the engineer sets. There is no question but what smaller valves, lighter springs and quiet cams can make the motor quiet. There is no question, either,

about piston clearances. It depends altogether on what results you want to obtain. I have had some experience with eight-cylinder motors. They can give absolute quietness, but they make better motors if they are set to give a little more life at the expense of a little quietness in curbstone idling."

At the request of Mr. Vincent, C. P. Grimes then gave some figures relating to the acceleration of the Packard twin six tending to show that the results obtained on the speedway had been identical with magneto and battery ignition. With a gear ratio of an amount giving 25 m.p.h. at 900 r.p.m. of the engine the Packard accelerated from 10 to 50 m.p.h. in 22.4 sec., this result being the average of several tests made by Howard Marmon.

With magneto ignition the result was the same figure within 0.28, the acceleration shown being from 10 to 50 m.p.h. in 22.68 sec. The maximum speed shown was about 74 m.p.h. in both cases.

Two Carburetors or One?

C. P. Grimes then said: "It just occurs to me that Mr. Vincent has developed a very fine twelve-cylinder motor and has been using a single carburetor, which seemed to work first rate. I would like to bring up a question at this time. A number of people are using two carburetors on a smaller number of cylinders than twelve. A few years ago, when the six first came out, it had many carburetors, and I believe the twelve is going to give excellent results with a single carburetor, but just at the present time I am not satisfied in my mind whether it is due to the range of the carburetor in general or whether it is the lack of a well to accelerate from, that so many single carburetors do not give very good results on multiple cylinder motors.

"Some of our men have been experimenting with an eight-cylinder Knight motor and have found two carburetors on that car would go over a certain hill at probably 30 per cent better speed and with more life to the motor than with a single carburetor.

"Another question I would like to ask is the mileage Mr. Vincent obtained. He speaks of increased compression in the motor and I am very much interested in finding out the compression pressure he uses and the mileage per gallon of gasoline he obtains with his cars and his idea on the carburetor end of it."

Mr. Vincent replied as follows: "We found that at any ordinary speed, a single carburetor is adequate. There is no question in my mind, however, but that you can get more power at extremely high speeds with a double carburetor. An interesting thing in this connection is that the valve timing is more important and more variable than it is ordinarily given credit for. Setting the valve timing at a point where the exhaust opens at 50 deg. early and the intake closes at 50 deg. late, which is more or less conventional L-head racing timing, we found we did not get any increased horsepower from a single carburetor, at the high speeds, over the horsepower obtained with the timing set for touring, but by putting on a double type carburetor (in this case I think we used a Zenith), we got quite an increase. That is we got 117 hp. at 3200 r.p.m. I do not believe the extra horsepower that was obtained is of any particular advantage in touring car practice but it might be at some future time.

Economy Vs. Maximum Power

"As to economy, running the motors with the conventional valve timing, we made a test the same day with a double carburetor which had been adjusted to an economy setting rather than the highest horsepower setting and the double carburetor did not show nearly so well, in fact, it gave, if I remember correctly, 8 miles to the gallon as compared to 11, which is entirely too large an item to be neglected. I believe

(Continued on page 620)

Individual Valve Cams in Enger Twelve

Oil Is Fed Through
Chain-Driven
Hollow Camshaft with Twenty-
Four Cams—
60 Deg. V Motor $2\frac{5}{8}$ by $3\frac{1}{2}$ —
Lists at \$1,095

THE Enger Motor Car Co., Cincinnati, Ohio, has placed on the market a twelve-cylinder car to sell for \$1,095. Demonstrators have already been shipped and the factory in Cincinnati, Ohio, has now busily turned their attention to the production of this car which is the lowest price attained by a twelve-cylinder model and marks a step in the industry which two years ago would have been considered unbelievable.

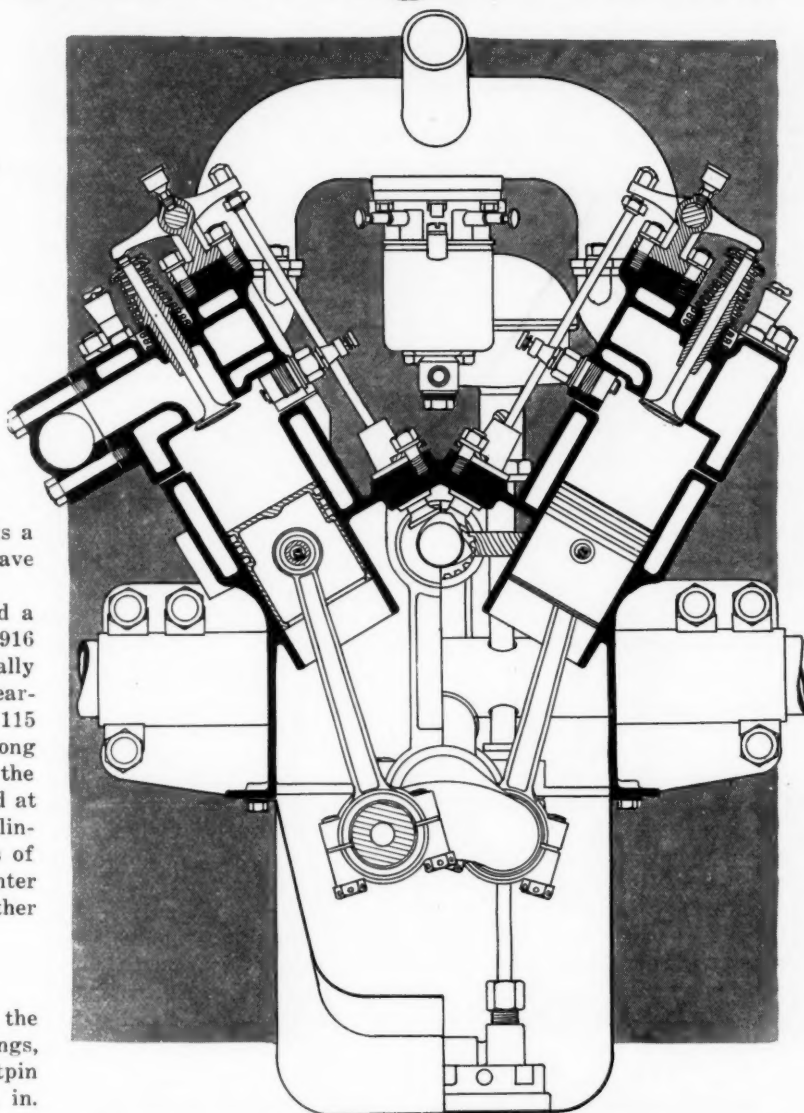
The Enger company in the 1915 season marketed a six-cylinder car. This has given place for the 1916 season to the twin six, which will be built practically entirely in the Cincinnati factory. In general appearance the car is low and long, having a wheelbase of 115 in. and a straight-line body design which gives a long appearance. The small bore and stroke have given the designers an opportunity to keep the parts light and at the same time produce a compact engine. The cylinders, which are $2\frac{5}{8}$ by $3\frac{1}{2}$, are cast in two blocks of six and placed at an angle of 60 deg. from the center line of one-cylinder block to the center line of the other in the planes of the axes.

Light Reciprocating Parts

Light weight reciprocating parts are a feature of the motor, the pistons reciprocating weight including rings, bushings, upper half of connecting-rod and wristpin total but 25.9 oz. The length of the piston is $2\frac{3}{4}$ in. and the number of rings, three. The connecting-rod length is $7\frac{1}{2}$ in., and the rods are drop-forged from carbon steel. These light weights should provide the motor with smooth running qualities at high speed and the bearing areas are ample to take care of the small unit pressures existing in a power plant of this kind. The connecting-rod bearings are $1\frac{1}{2}$ in. in length and $1\frac{1}{2}$ in. diameter and the crankshaft bearings are $1\frac{3}{4}$ in. diameter and $2\frac{1}{4}$ in. length. The material of the crankshaft is 0.40 carbon steel. This is a heat-treated drop forging.

Although following the dictates of twelve-cylinder design the lessons learned of motors of four cylinders have not been forgotten. Following the practice which is rapidly becoming general throughout the entire field the cylinder heads are removable, making the motor readily accessible for inspection and cleaning. In the particular overhead valve construction used in the Enger the detachable cylinder head also provides an easy adjustment for the valve tappets, a point which is quite necessary to consider in a twelve-cylinder motor which has twenty-four of these tappets requiring attention if the full efficiency of the motor is to be secured at all times and under all conditions.

One of the interesting features of this design is the arrangement for valve drive. Each valve is operated by an in-



Section through the Enger twelve-cylinder motor which consists of two blocks of six cylinders each set at an angle of 60 deg. There is a separate cam for each of the overhead valves, or twenty-four cams in all, mounted on a single hollow chain-driven camshaft in the center of the V, where are also mounted the carburetor and the ignition unit. Note the mounting of spark plugs on inner sides of cylinder block and the large water outlet manifold

dependent cam, giving twenty-four cams in all. The camshaft is hollow, providing rigidity which is naturally essential in a unit of this nature. With the material massed at a distance from the neutral axis of the camshaft this rigidity is secured, while at the same time the bearing speeds, due to the increased diameter, are not high enough to be detrimental to the bushings. At the same time the hollow camshaft provides a method of lubrication which is very efficient for motors of this type as it allows the oil to be fed under pressure through the camshaft.

Chain drive is employed for the camshaft which is not of constant section throughout its length. It is carried on three bearings which have respectively diameters of $1\frac{1}{4}$, 2 and $2\frac{1}{16}$ in. respectively. This design is worked out to give practically a constant strength throughout the entire length of the shaft allowing sufficient material to take the stresses developed at any point along the length of the shaft.

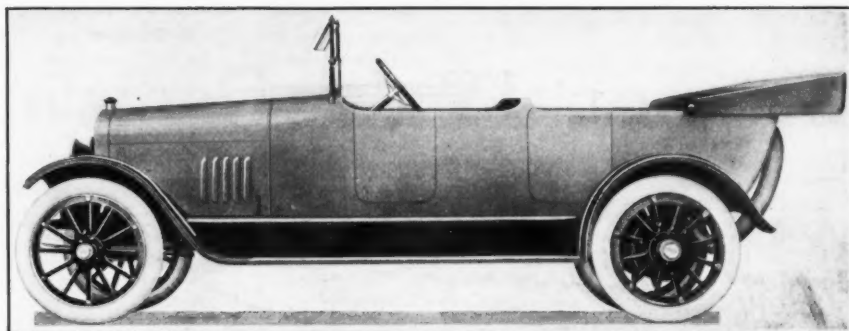
With practically the entire valve mechanism exposed and practically under the eye of the operator no fear for the possibility of weak explosions in one of the units of the twelve-cylinder assembly need be felt. The rocker arms are carried as shown in the illustration along a common axis provided with grease cups between each pair of arms, all of this being accessible by merely lifting the hood.

The water cooling arrangement is interesting, there being two outlets from the radiator to the waterjacket intake. The water enters the cylinders on the outside of the V at about half the length and from this point is carried and baffled so as to thoroughly cool the jackets for the full length of the motor. The water outlet from the cylinders is carried upward at the center through a common header and thence by rubber hose connections to the radiator. This arrangement provides a single inlet and a double outlet and thus allows the water to utilize all the available area of the radiator without danger of having two separate streams with a pocket in the center.

The ignition drive is directly from the camshaft and provides either automatic or hand advance as desired. It operates in connection with a battery system and a timer distributor is mounted at the rear of the engine with the wires carried through hose leads which prevent chafing against the water connections or the tops of the cylinders.

An interesting point in the design, and showing the characteristic rigidity, is the mounting of the fan bracket. This is carried on a platform at the forward end of the motor with the fan shaft projecting through the housing giving a firm support on both sides of the camshaft in taking the drive.

One of the places in which weight is saved on a motor of this type is in the flywheel. This has a diameter of 14 in. and a weight of 40 lb. The clutch is mounted in the flywheel and the bell housing is continued back from the crankcase. This gives a rigid support for the forward end of the gearbox. Three speeds are provided by the gearset which is made up of $3\frac{1}{2}$ per cent nickel steel gears. The center control lever is mounted on the cover of the gearbox and, as will be noted from the illustration, this is a compact unit of small size.



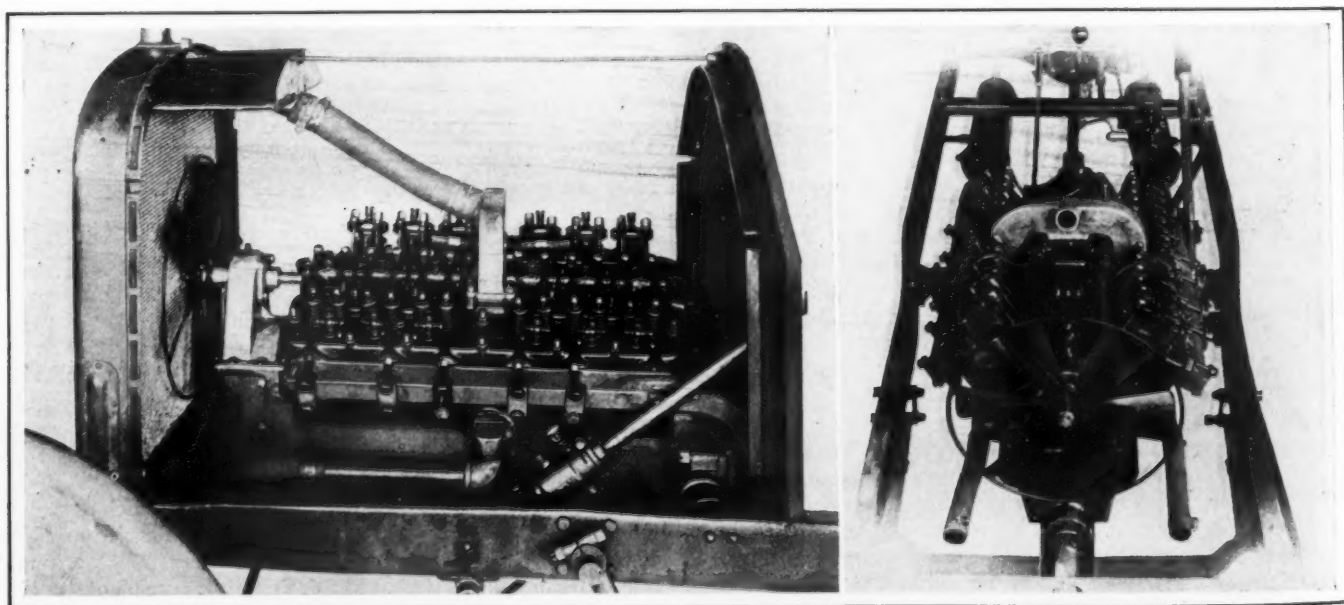
The Enger twelve-cylinder five-passenger touring car for 1916 which sells for \$1,095. Note the smooth body lines and long appearance

The drive is through two universals of the Hartford type to a Hess rear axle. The differential gears are spiral bevel and are carried on Gurney ball bearings. The hubs are provided with Bower roller bearings and the torque is taken care of by a torque arm mounted on the axle housing and carried to the rear cross member. The propulsive thrust is transmitted through the cantilever rear springs to the frame side members. The cantilever rear springs are long, extending forward to a point well up along the frame and giving a frame which should have an easy action on rebounds.

Two Independent Mufflers

Other features about the chassis which should be mentioned include the mounting of the twin exhaust line with two independent mufflers which are swung between cross members and which provide independent outlets for the exhaust gases of each set of six cylinders. The frame is bottle-necked, allowing a narrow turning radius. The starting and lighting systems are accessibly mounted, the starting motor meshing directly with the flywheel and the generator being directly driven by chain at the forward end of the motor.

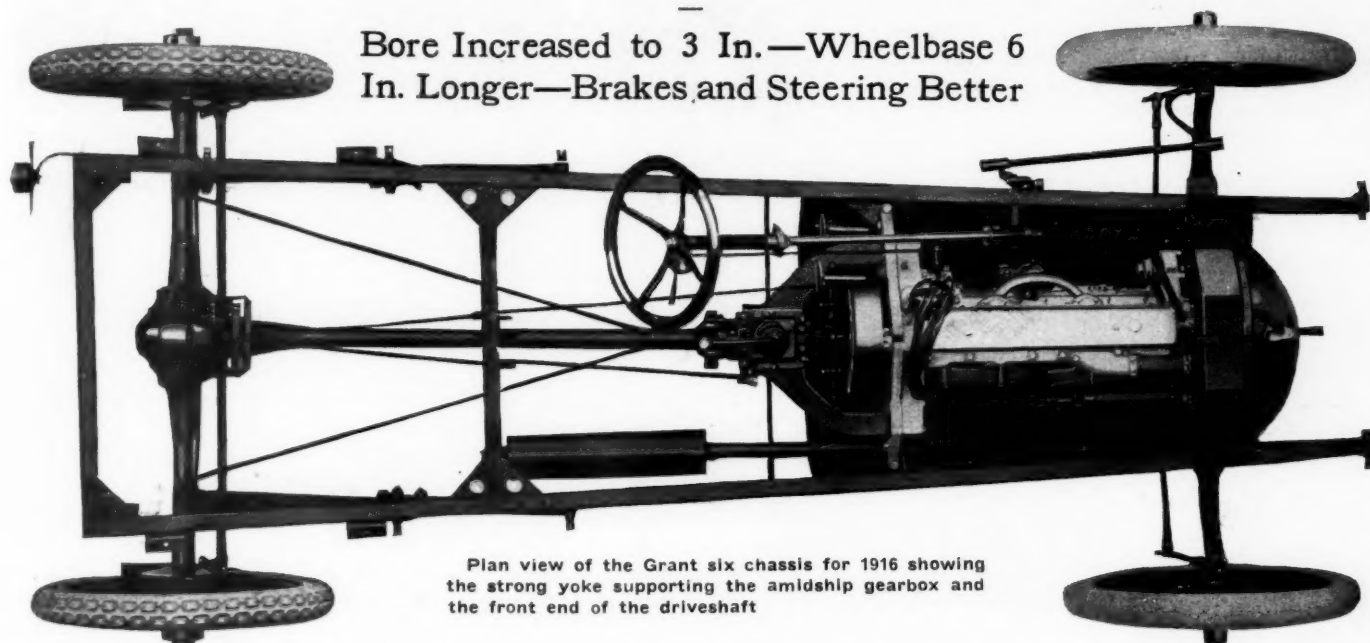
Standard equipment includes a five-passenger body with slanting windshield, Gemmer steering gear, gasoline tank in the cowl, Atwater Kent ignition and a full line of accessories and tools. In its finished condition the car gives a handsome appearance, being provided with real leather upholstery over hair cushions. The body is roomy and attractive, being thoroughly up-to-date in design and providing all the seating capacity necessary.



Left—Enger twelve motor mounted in chassis. Note the high narrow radiator and the accessibility of the motor due to its low mounting in the frame. Right—Front view of Enger twelve power plant as it appears with the radiator removed from the frame of the chassis. Note separate water intake for the two blocks of six cylinders and the large single outlet manifold at the top of the V

Larger Motor in 1916 Grant Six

Bore Increased to 3 In.—Wheelbase 6 In. Longer—Brakes and Steering Better



Plan view of the Grant six chassis for 1916 showing the strong yoke supporting the amidship gearbox and the front end of the driveshaft

NOW entering its second year, the Grant six, product of the Grant Motor Co., Findlay, Ohio, is a larger car with a motor of increased power due to enlargement of the cylinder diameter from 2 $\frac{7}{8}$ to 3 in. The wheelbase has been lengthened a full 6 in., making it now 112 in., and this has permitted of much lengthening of the body and a better proportioning throughout. Coupled with these more important differences, the new Grant has also been considerably refined in a number of details which, though they do not show on the surface, help to make the car a better vehicle mechanically. For instance, the brake size has been enlarged to give greater ability to stop in a short distance; there has been a steering gear improvement, a slight added feature to the clutch, and the front axle has been increased in size. Though from these facts it is quite evident that the 1916 Grant is a bigger value than it was before, the price has been retained at \$795 with complete equipment, this being possible, it is said, due to greater factory economies, and better manufacturing prices made possible by greatly increased production.

New Body Lines

The new body lines are the first thing to be noticed when inspecting the car. The popular trend has been carried out, and a modification of what is known as the boat-line design is used. The sides of the body have been somewhat raised, and the cowl is also brought up higher, with very little difference between the slope of hood and front of car. The hood is also higher to conform, and though the radiator retains the characteristic Grant round form, it is larger and more smoothly built.

In the rear, full three passenger seating capacity is attained by the length of the seat. To accomplish this, the body extends out over the wheels somewhat, and the fenders are set into the wheel houses. This not only gives a substantial construction, but adds to appearance.

Mechanically, the Grant six employs the design wherein the power plant unit takes in clutch and gearset, and the rear axle unit incorporates a torsion tube surrounding the driveshaft. The engine is now 3 by 4 $\frac{1}{4}$, the gearset has three selective speeds, and the clutch is a cone type.

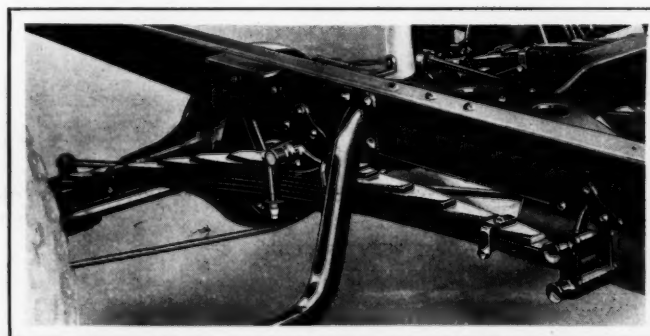
Other specifications include Atwater Kent ignition, Allis-Chalmers lighting and starting, floating rear axle, and cantilever rear springs.

In increasing the motor bore from 2 $\frac{7}{8}$ to 3 in., the Grant concern steps up the S. A. E. horsepower rating from 20 to 21.6, and increases the piston displacement from 165.5 cu. in. to 180.2. Thus, while the increase in horsepower does not show up materially in the rating, the displacement gives some idea of what the bore increase means. The engine, in fact, ought to give fully 10 per cent more power.

Overhead Valves

The Grant motor is an overhead valve design, with the valve rods running up from the left side. The valve rocker mechanism is completely housed by a cover plate at the top of the motor, so that when it is in position all that is visible of the valve mechanism is a portion of the rods. The head, carrying valves and rockers, water outlet connection and manifolds, is detachable from the main cylinder block, which is in unit with the upper part of the crankcase. The exhaust manifold is a separate casting bolting to the right side of the headpiece, but on the right there are two openings running to a two-branch manifold to take care of the incoming gases. The distribution passages are cored within the head casting.

Instead of using the former mushroom type of valve tappets, the new form is of the roller design. The cams



Ingenious method of pivoting rear cantilevers under the frame

now come in contact with the rollers and thus the side thrust component is eliminated, this making for less wear and also tending to reduce noise. Then the method of assembling the tappets into the crankcase has been changed so that they can now be removed without disturbing the camshaft—a feature which will be appreciated if the owner ever has to take one of them out. The tappets have also been bushed, and there is no chance for oil leakage past them.

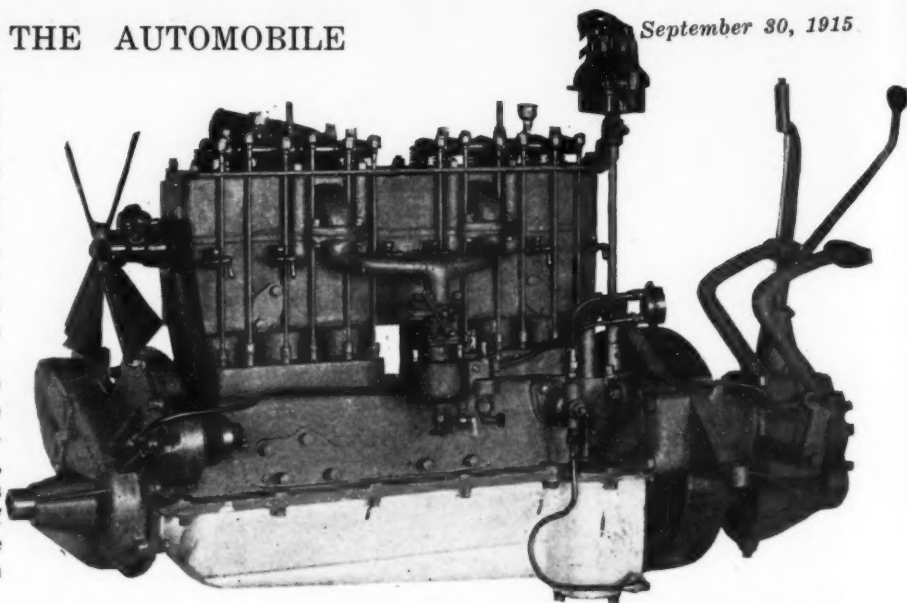
Standard practice prevails throughout the internal mechanism of the motor, and notable smoothness is attained through a good running balance to the reciprocating parts, coupled with rigidity of the crankshaft. This may partly be ascribed to the proportions of the three-bearing shaft and partially to the casting of the upper part of the crankcase in unit with the cylinders.

In its application of the Allis-Chalmers single-unit starting and lighting system, Grant places the motor-generator on the right forward side of the engine base, bolting the head to the housing of the silent chain that drives it, and supporting the rear end on a bracket. This makes a very substantial mounting, which is one of the essentials of electric units of this kind. Between the head of the starter and the housing there is interposed an eccentric, drilled with a number of holes. Shifting of this eccentric, after the cap screws have been loosened, takes care of the chain adjustment. The storage battery is an 80 amp.-hr. type, and it is carried in a special steel basket concealed under the front of the right running board splashers. The electric system operates on 6 volts and is of the single-wire type with grounded return.

In the thermo-syphon cooling system the radiator is the only change. This is of an entirely new design for Grant, having a double construction. The outer shell attaches to the frame of the car and supports the inner core. Thus any weaving of the frame or other stresses to which the radiator might be subjected are absorbed by the shell and are not communicated to the core, which is thus made more efficient because there is less chance for seams to be sprung or leaks otherwise to develop.

Two gallons have been added to the capacity of the gasoline tank under the cowl, this feeding by gravity to the Rayfield carburetor which is fairly high on the left, and which is fitted with a waterjacketed manifold. No change has been made in the oiling, which is by a splash system with circulating pump feed and gage on the cowl board.

The Atwater Kent ignition distributor device now has a polarity switch, so called. This serves to prevent the fusing or corroding of the timer, and should tend to make



Intake side of Grant six power plant for 1916 showing overhead valve mechanism

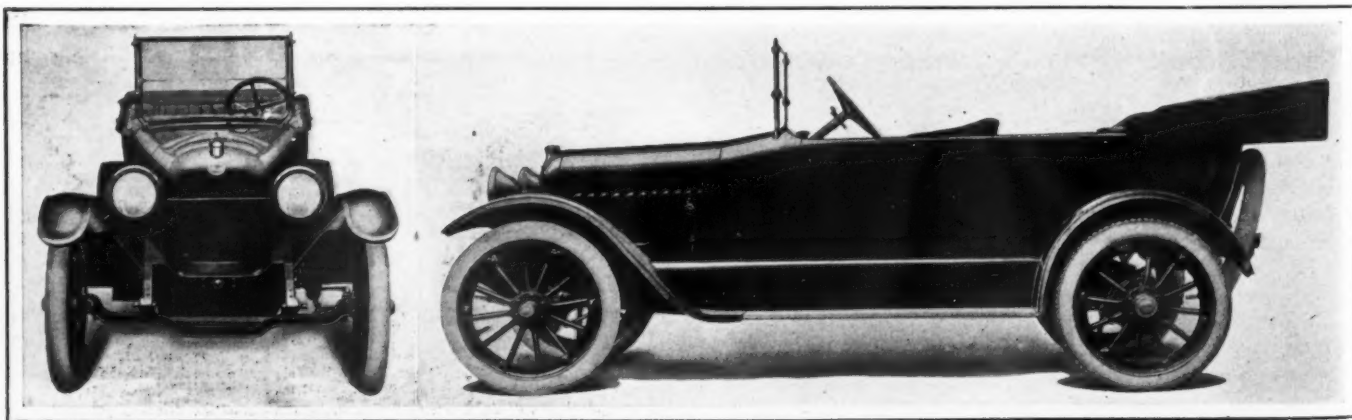
the ignition even more reliable and permanent. The distributor unit is at the left rear side of the engine, driven by a vertical shaft which is itself operated by gear connection with the end of the camshaft.

The Transmission System

Construction of the driving mechanism back of the engine is quite conventional. The gearbox is bolted to the rear of the crankcase by a yoke construction. The flywheel is uninclosed, and the arms of the yoke pass around it to bolt to the rear of the supporting portion of the back end of the power plant. The yoke leaves plenty of room for the cone clutch and its operating mechanism. There is a refinement in the clutch to the extent of putting in a ball-bearing design of throw-out mechanism, making it easier to operate and at the same time lessening wear and reducing the problem of properly lubricating the bearing surfaces. Adjustment for the amount of tension of the engagement springs is quite simple.

Annular ball bearings carry the gearset shafting, which is very compactly arranged. Center control with a swivel lever is used, and the shifting mechanism is all assembled with the top plate that covers the gears. The torsion tube which incloses the propeller shaft finds a good front end mounting back of the universal joint, and has brace rods running diagonally back to the outer ends of the axle tubes.

In the back axle there is no change. It is a floating type, adjustable, and having differential and pinions on one carrier as is common practice. Ball and roller bearings carry the shafting, and there is an unusually large plate at the rear to get at the differential. With a gear ratio of $4\frac{1}{2}$ to



Left—Front view of Grant six for 1916 which sells for \$795. Right—Side view, showing smooth lines of Grant five-passenger body

1, this axle is well fitted to take care of the power it receives. In the braking system there has been a widening of the bands to give increased braking surface. The brake equalizers are mounted on the forward side of the axle housing at the middle, this method of positioning them calling for the use of but one brake rod forward to each brake control.

Cantilever Rear Springs

The rear cantilever spring suspension is nicely laid out for free action. The springs are of the full cantilever form, with the center trunnion to the under side of the frame rail and the front end shackled to it. A considerable taper is given the frame from rear to front in order to make an easy turning radius and to offer good support to the sloping body along its entire extent. This construction of the frame is commendable, for while roominess of body has been accomplished, it nevertheless is not done by sacrificing the strength of the car as a whole. Frame cross bracing is also ample, for there is an intermediate member gusseted to the side rails in addition to the front and rear cross arms.

There have been some additions to equipment, each making for greater general satisfaction of the driver. The windshield, for instance, is of a new type with curved base and attached directly to the cowl with no filler board. On the rear wheels, non-skid tires are now fitted instead of plain treads, and besides this, Firestone demountable rims are now used. The tires are still 32 by 3½. Dimmers have been fitted to the lights, which will add to the comforts of city driving. On the cowl board, the electric instruments have been nicely grouped and a dash lamp added to illuminate them. In this electric unit group there are the polarity switch, ammeter, the electric regulator and the fuses. Bringing all the electric apparatus to one central point is a feature of the construction of the modern car's electric system which has developed along with greater reliability and general efficiency of the outfit.

An outward noticeable alteration in the new Grant is the standard body color. This has been changed from black to a Brewster green for the body. The fenders, hood and running gear are still black, however.

Why the 1916 Cars Are Cheaper

(Continued from page 597)

of price and cut off the peak of 1914 and then the decline to 1916 does not look so alarming.

What really has caused the excitement is not so much the cuts in the prices of known cars, but the advent of so many new ones. We have long been accustomed to cars selling at prices from \$500 to \$800 and we know about what to expect in the way of body comfort, appearance and finish as well as in road performance and chassis durability.

The fact that a good many more manufacturers have entered the field with cars in the \$750 class does not affect the class of the \$750 cars. Just like their more expensive brethren they are better cars for the money than we have had before, and for the same reasons precisely, but it is absurd to pretend that a little six at \$750 or thereabouts is as good an automobile as the average of the \$1,000 sixes of last season. Of course they cannot possibly be. Size has a good deal to do with it as a motor costs more or less according to its total piston displacement rather than according to the number of cylinders. When all the cylinder machining operations are done simultaneously on one block of cast iron a small six of 250 cu. in. size will be actually cheaper to machine than a larger four also of 250 cu. in., since all six bores are cut together more rapidly than all four of the larger size could be.

Considering new jobs which appear to be wonderfully low priced, one outstanding example has a six-cylinder motor of 249 cu. in., which model replaces a 165 cu. in. four made last year. The engine design of the new six is simplified by comparison with the old four and the new motor actually costs a little less than the four did. The rest of the chassis has been altered but little, because any transmission and chassis strong enough for a 165 cu. in. four is plenty strong enough for a 249 cu. in. six with its more even torque. Thus the new six is really no more costly to make than the old four.

Another instance is the appearance of a six bearing the name of a medium class manufacturer of good repute at less than \$800. In this case examination shows a new motor for which the engine manufacturing concern has equipped, in conjunction with the class of gearset and axle components used in previous years for \$800 to \$950 fours. There is a considerable falling off in the body quality by comparison with the \$1,200 job the same concern was making last season, but cheapness is secured by the use of a simpler outline as well as by cheaper fittings and cheaper upholstery.

Another important body feature is the space, though there is some reason to think that this is being overdone on some

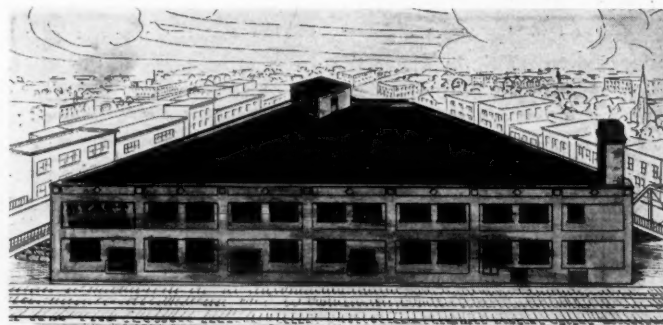
of the light sixes. Some idea of this is obtained by wheel-base comparisons which are found to show only a very few inches increase, and where a new light six replaces a four, the added length is seldom much more than that accounted for by the extra pair of cylinders. Many of the new bodies appear much greater in length than they are in actual fact, by virtue of the straight lines of the design.

In the absence of any proper record of weights it is difficult to compare tire equipment, but as most of the new designs are lighter than those cars which they replace it appears that the 1916 automobile is rather better supplied with tire section than the car of 1915; certainly there is no falling off in this respect.

Conclusion Is Better Value Everywhere

It is instructive to observe, by the report of the N. A. C. C. given out recently that during the past year the total number of cars made by members of the association has increased 36 per cent, while the value of the total has increased only 10 per cent, and these figures give a fairly good idea of the real truth of the price drop; it is not so enormous. The outstanding fact remains that more car for less dollars can be bought to-day than ever before and more car service also. Take any price car from \$500 to \$5,000 and it will be a better one than could be had for the same sum last year.

Hyatt Bearing's Detroit Warehouse



The warehouse to be built by the Hyatt Roller Bearing Company on the Michigan Central R. R. in Detroit, Mich., will have a frontage of 225 ft. and will contain 20,000 sq. ft. in its two stories. The first floor will be on a level with the floors of the freight cars and the second floor will be on the street level. Freight will move in only one direction, Detroit freight going to the second floor while that for other points remains on the first.

• *The Engineers' Forum* •

Art in High-Speed Motor Design—Quietness, Absence of Vibration and Power at Low Speeds Imperative

By W. B. Stout

Chief Engineer, Scripps-Booth Co.

DETROIT, MICH.—Editor THE AUTOMOBILE:—Mr. Gerster's series on the design of high-speed motors appearing in several issues of THE AUTOMOBILE last spring very thoroughly covered those technical engineering problems which are related to a motor's performance as a machine, and, as such, are not to be criticised.

A large part of modern automobile engineering, however, consists of the fitting of this technical engineering to the mind of the public in such a way as to make this engineering commercial, and a proposition of the least sales resistance. In this psychological branch of engineering, there are rules just as definite and mental formulas just as important as are the relation of valve lift to diameter, or heat-treatment to crankshaft material.

It is the ignoring of these items which very often condemns otherwise masterly engineering so that before laying down the high-speed motor for an actual production and sales proposition, these psychological items must be taken as part of the business and profession of the modern engineer.

Performance and Appearance

In order to sell, a motor must satisfy the mind of the buyer in appearance and performance. It must satisfy in appearance before he will give it an open mind on the standpoint of performance. In other words, it must satisfy his eye first. This makes the design—after the technical engineering is taken care of—a problem of art, and art rules which are just as definite as mathematical-engineering rules may be applied to the exterior of the motor even outside of its finish, which will gain the favor of the buyer through his eye, and thus instill in his mind the desire to see it work. A beautiful machine is beautiful because of its following of art principles, but a beautiful machine is always more attractive when performing the function for which it is designed. Hence, a motor in action is the next desired step to a prospective purchaser.

Lack of Vibration

The eye satisfied, the ear is the next mental stage to be appealed to. This is where the greatest problem of the high-speed motor comes to the designer of this type of American use, for quietness and lack of vibration is the first requisite in a really high class car.

The motor must sound right and must not give an impression of laboring nor of shaking itself out of the frame. This means abnormally light reciprocating parts on a gear ratio not abnormally low, and if the gear ratio is not abnormally low, where is the value of the high-speed motor?

The reason for the high-speed motor I have indicated in Fig. 1, showing a car with a 300-in. motor on a 2 to 1 gear ratio. This car will give a certain performance of pulling power and speed, but its greatest necessity is power at low speeds. An electric automobile of 2500 or 3000 lb. weight is generally fitted with a motor of 4 or 5 hp. This motor, however, delivers this 4 or 5 hp. at practically any speed, and

with a 100 per cent overload possibility for continued periods. The gasoline motor to give an equal performance on a car of equal weight, must develop this 4 hp. at the slower speeds, and from this, must be able to carry the car up to a maximum of say 45 m.p.h. Forty-five miles per hour is all that the average public requires of speed.

Power at Low Speeds

Practically every owner makes this statement, but at the same time while boasting that his car will do 60 m.p.h., and saying that he never uses it, makes the statement "but I want that power at low speeds."

This power at low speeds—which is the most necessary power of all—is a question of gear ratio. The average owner in his touring, driving and his city work runs between 20 and 30 m.p.h., rarely exceeding this and very often running under it in average. This being the case, it is only reasonable that the motor of a car should develop its best power at these speeds.

If a high-speed motor is designed to run at 2500 r.p.m. normally with a maximum of say 3500 and the speed at the 2500 mark is 30 m.p.h., this would require a gear ratio of about 8 to 1 on 32-in. wheels. On a gear ratio of 4 to 1 on 32-in. wheels, this car would be doing about 38 m.p.h. at the best speed of the motor—2500 r.p.m.

Maximum Torque at Low Speeds

This is figuring from the horsepower standpoint, but the torque curve is the one which counts in this power item. An engine should show its maximum torque or twist at a fairly low speed and carry this along a straight line clear up to its highest revolution per minute. A motor showing its greatest horsepower or peak at 2500 may show its maximum torque at around 800. Figuring from this speed, on a $3\frac{1}{2}$ to 1 gear ratio on 32-in. wheels, the car would be doing about 21 m.p.h. The problem in the high-speed motor however, is to have a torque curve which is at a maximum at as low a revolution per minute as is necessary, as many high-speed motors of the racing type do not show this torque maximum below 1000 r.p.m., which means on a 4 to 1 gear ratio about 32 m.p.h. in the average car.

Going back to Fig. 1, one can see why a high-speed motor on a low gear ratio is a wonderful advantage, for in Fig. 2 is shown a 100-in. motor on the same dimension chassis as in Fig. 1 with a 6 to 1 gear ratio at the rear. This arrangement will give every performance of the 300-in. motor except maximum speed, but the 100-in. motor will give well within the range of 45 m.p.h., and show below that point every power advantage of the 300-in. motor, and at some points even better performance. The 100-in. car can be made of one half the weight of the 300-in. car or even less, while the motor should weigh less than one fourth what the 300-in. motor weighs. This gives the 100-in. car every advantage in soft road, for the ability to pull through sand and mud depends on road resistance related to torque, and the resistance

on soft roads varies as the square of the weight. This is why a light car will go through mud and sand where the heavy car sinks in and fails, even with more horsepower per pound.

Fig. 2 thus gives the reason for the high-speed motor giving more power per pound of chassis weight, with the same motor car performance in half the motor car weight.

The limitation of the high-speed motor at present in America is not so much the engineering difficulty of building the motor, but rather of making a low gear rear axle which will be quiet and cheap enough for production. This is from the engineering standpoint.

From the psychological standpoint, the problem is to so balance the high-speed motor that the one riding in the car may not get the impression of a car always on second gear—a thing which the average driver will not like until he gets used to it, and in a sales period one cannot get used to these things. A high speed motor must therefore be wonderfully balanced and made with minimum weight in the reciprocating parts—an indication of the eventual arrival of multi-cylinder motors for all high-speed types.

Americans Dislike Gearshifting

One brings up the point that the Europeans do not gear their high-speed motors much higher than their lower speed motors, using the difference for speed alone. This is very true in most cases, but remember that the foreigner is allowed on these roads unlimited speeds, both by law and by road surface. Also, the foreigner likes to shift gears. When his motor runs to 1000 r.p.m. he shifts to second and takes pleasure in doing so. The American is annoyed if he has to shift gears to go up the side of a mountain, feeling that by racing his motor on second gear, he must make up for the speed he has lost in shifting from high. On this account, if the high-speed motor is to give the same performance below the American's maximum touring speed, a lower gear ratio must be fitted. The problem of the high-speed motor in America, therefore, first resolves itself not into a technical problem alone, for this practice is very well understood by now in America, but the difficulty lies in fitting high

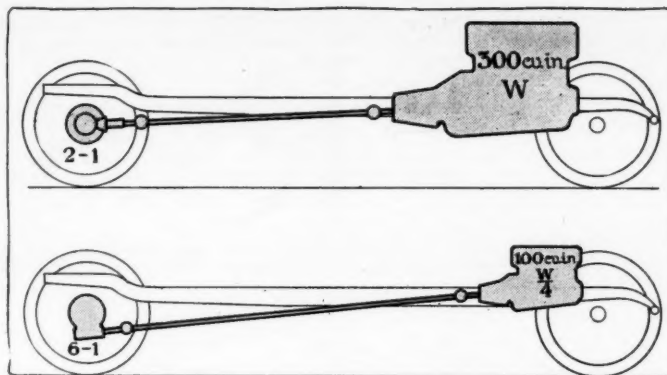


Fig. 1—300-in. motor, 2 to 1 ratio, car weight W . 1200 r.p.m. at 60 m.p.h. Maximum torque at about 40 m.p.h.

Fig. 2—100-in. motor, 6 to 1 ratio, car weight about $\frac{W}{4}$, 45 m.p.h. maximum at 3000 r.p.m. Maximum torque at 17 m.p.h.

speed practice to those more or less distorted ideas which have been put into the minds of the American public, concerning motor performance on high gear. The engineer who can build a car with a high-speed motor on a low gear ratio, having the business-like appearance and the psychological sound and feel of right construction the first time you ride in it will first make a success of high-speed motor car construction in America.

An Eventual Type

As efficiency is always the basis of growth and development, and as better things are always an advantage to everyone connected, we have an indication that the high-speed ultra-refined motor is an eventual type, and it would be well if salesmen as well as engineers would follow the new development that they may make no mistakes in statements concerning their big motors which cannot be substantiated by the authoritative analytical engineering of Mr. Gerster's article.—W. B. STOUT, Chief Engineer, Scripps-Booth Co.

Commercial Line of Delivery Bodies

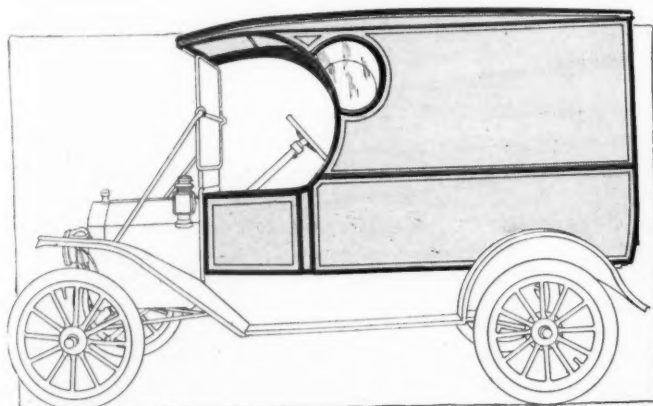
The Commercial Auto Body Co., St. Louis, Mo., is putting out a complete line of bodies for delivery service and kindred commercial purposes which can be fitted to any chassis. These bodies are built with seasoned ash sills, ash frames with floors running lengthwise, reinforced hardwood floors with strips of steel, and durable trimming material. Leatherette is used in the cushions instead of cheap enameled drill, the cushions being one piece, open bottom spring design, locked in position so as to prevent them from springing forward and backward. All the roofs are full

slatted, covered with heavy oil duck and on express bodies the curtains are of the same material.

Among the bodies which are made by this concern to fit any chassis, are the open express, full panel delivery, light-weight express top with screen sides, light-weight canopy style top with flareboards, suburban canopy style for station work, flareboard delivery, demountable flareboard box and general utility box inclosed with double doors.

These bodies sell complete for \$100 with the exception of the light-weight canopy design with flareboards which is \$90 and the flareboard delivery which is \$60. The demountable flareboard box which fits on the back platform of a Ford roadster, or other type of roadster, is \$14.50 for the Ford, and \$19.75 for others. The general utility box is \$25 complete, and can be made to fit snugly on the platform of a Ford roadster.

A special line of delivery bodies for Ford cars made to be placed either on the Model T roadster or touring chassis, is of special interest. This includes the following types: A panel side delivery body, 56-in. long and 53-in. wide with double doors, for \$110; a panel delivery body of the same dimensions, with double doors having oval glass in the upper panels and drop sash windows at the side of the seats for \$115, an all steel panel body for \$120, an all steel delivery for \$100, duck curtain delivery for \$75, light panel side delivery for \$82.50, and demountable slip on body for \$95. In addition to these there are other bodies at corresponding prices.



Panel delivery, one of the Commercial Auto Body Co.'s styles

The Rostrum



Correct Slot-Size for Piston Rings

EDITOR THE AUTOMOBILE:—What is the proper width, or opening of the slot in a diagonally cut piston ring? Does it vary with the size or is it standard for different cylinder diameters?

2—Can a magneto, without disassembling, be tested on a shop bench to ascertain if magnets are weak without using special equipment? If so, how?

3—What clearance is allowed aluminum pistons in relation to the bore of the cylinders?

4—What is the factory rating of cylinder compression in pounds of the White 30, 45 and 60 hp. cars?

San Francisco, Cal.

C. S.

—The size of the slot in a diagonally cut eccentric ring does not only vary with the diameter of the ring but also varies with the different manufacturers. Some only take out the width of the cutter, which will be approximately 0.015 in. Others make a practice of taking out as much as $\frac{1}{4}$ in. in all sizes. The latter is true especially for two-cycle motors of the marine type.

2—The magneto can be removed from the car and driven by belt at various speeds. If the magnets are weak, it can be detected by the weakness of the spark at low speed. If you will write the manufacturer of the magneto he will tell you the width of the gap that the magneto spark should jump under atmospheric pressure at different speeds.

3—This is a quantity which has not as yet been worked down to standard practice and varies in the different alloys and also varies for different manufacturers.

4—Compression in the cylinders of the White motor is 90 lb. for all the models mentioned.

Valve Diagram for a Model 19 Buick

Editor THE AUTOMOBILE:—Kindly give me a valve diagram for a Buick model 19 and also the gear ratio of this car in the three speeds.

Barberton, Ohio.

F. S.

—The valve diagram for the Buick 19 is given in Fig. 2. The timing of this model is: Exhaust closes $\frac{1}{16}$ in. after upper dead center and the inlet opens $\frac{3}{32}$ in. after the upper dead center. The back lash is .005-in.

The gear ratios on the first, second, third and reverse speeds and also on the rear axle are as follows:

Speed	Reduction	Speed	Reduction
First	3.36 to 1	Reverse	4.32 to 1
Second	1.5 to 1	Rear axle	3.5 to 1
Third	Direct		

Valve Lifts of Various Motors

Editor THE AUTOMOBILE:—Do the valves of the Model T Ford open $\frac{1}{4}$ in.?

2—What is the diameter of the valves used on the Pierce-Arrow, Packard and four-cylinder Stutz?

3—Do the valves of the above named cars open an inch?

New York City.

T. K.

—The valve opening is $1\frac{1}{4}$ in. and the lift $\frac{3}{16}$ in.

2—The diameter of the valves on the Packard twin six is $1\frac{1}{2}$ in. and the lift $\frac{5}{16}$ in. On the Pierce there have been slight changes from time to time, but these points have not been varied to any great extent. The present models which this concern is building began to appear in June, 1914, and will continue until Jan. 1, 1916. They are known as the series 3 cars and the approximate valve diameters are $1\frac{15}{16}$ in. for the 38 hp., $2\frac{1}{4}$ in. for the 48 hp. and $2\frac{1}{2}$ for the 66 hp. The dimensions given are those for the smallest diameter of the valve as shown at C, Fig. 1. These are practically the same as the diameter at A, which is the passage immediately below the seat. The lift of the valve is measured by the distance d which is the eccentricity of the cam and is very closely $\frac{11}{32}$ -in. for the 38 hp., $\frac{3}{4}$ in. for the 48 hp. and $\frac{7}{16}$ in. for the 66 hp. on the exhaust side and a trifle less than this on the inlet.

On the Stutz the valve diameter is 3 in. and the lift $\frac{5}{16}$.

3—This is answered under question 2.

Trouble Not Due to Magneto Setting

Editor THE AUTOMOBILE:—Would you please tell us how we could get at the gears of the National K-4 magneto on the Reo car so that we may set them because the spark is too late?

Manitou Beach, Mich.

C. M. R.

—It seems quite certain that your trouble is not in your magneto. If the spark is late as you state, it is no doubt due to an improper adjustment of the breaker points, or it may be possible that the magneto has shifted slightly from its original position, which would have a tendency to affect the accuracy of the timing.

The instructions for the care and adjustment of National magnetos as issued by the National Coil Co., state that in setting the timing No. 1 cylinder should be placed in firing position at full retard and then the magneto should be set so that the traveling arrow on the timing dial is opposite to line No. 1. The coupling is fastened in this position and the magneto is then timed. The plug wires are then connected to the distributor terminals to correspond with the numbers on the timing dial.

Displacement Not Only Motor Criterion

Editor THE AUTOMOBILE:—On page 466 of THE AUTOMOBILE for Sept. 9 the following statement is made: "Another argument which is frequently advanced in favor of the long stroke motor is that for a given displacement per minute the piston speed is less." This is true only when the bores of the short stroke and long stroke motors are the same or nearly so. Then the long stroke motor has a greater piston displacement than the short stroke. Then most certainly the long stroke motor would pull better on hills. It is a bigger motor. It would then have a slower piston speed for a given displacement per minute.

Do you realize how absolutely absurd it is to compare long

and short stroke motors when they are not of the same piston displacements? Do you suppose that a 3 by 6 motor is more powerful than a 3 by 3 motor merely because the former is a long stroke motor? It is entirely impossible to make any fair comparison of the performance or qualities of long versus short stroke motors unless, first of all, they have the same piston displacements.

For several years, unscrupulous advertising managers and salesmen have been talking long-stroke nonsense. THE AUTOMOBILE is no place for such. A $3\frac{3}{4}$ by $5\frac{1}{2}$ single cylinder has 63.51 cu. in. piston displacement and not 97.5 as stated in the first column at the bottom of page 467. Why was it not stated that the compression pressure of 60 lb., 75 lb. and 90 lb. per square inch are the absolute pressures? How was F. E. B. to know from the answer given him that the pressures were absolute and not gage pressures?

Chicago, Ill.

R. E. C.

—Very probably a good part of the discussion on long stroke motors has been due to the fact that there has been no absolute definition of long stroke. The average stroke bore ratio of American cars has been rising steadily since 1911. At that time the average motor was practically square with the ratio 1.01 to 1. The average stroke bore ratio of the 1915 car was very close to 1.33 to 1. Whether or not a motor with a 1.33 to 1 ratio can be called a long stroke motor is only a matter of opinion.

Regarding the matter of piston speed, it is of course a self-evident fact that piston speed is a direct function of length of stroke and with any two motors having the same displacement, the motor with the longer stroke has the higher piston speed for a given revolutions per minute since the piston must travel further in the same length of time. It is quite possible, however, to compare the efficiencies of motors which have not the same piston displacement because revolutions per minute is as much of a factor in calculating horsepower as is piston displacement. We may have two motors capable of developing the same horsepower with widely different displacements. The case you cite of a 3 by 3 as compared with a 3 by 6 is of course an extreme one and hardly likely to be other than self-evident, but on the other hand, consider the two motors as cited in the paper by J. G. Vincent on twelve-cylinder motors. In a part of this paper read before the Detroit section of the Society of Automobile Engineers, Mr. Vincent remarks that before bringing out the twin six a single six-cylinder motor known as the 28 was developed which contained practically 100 cu. in. less piston displacement than the 3-38 while it developed a horsepower practically equal to the latter. In line with this, he says, "I became more and more convinced that the small bore high-speed motor is going to be the final answer in this country as it has been in Europe."

While no direct reference is made to the length of stroke

it is quite certain that a motor which had a ratio approximately equal to that in the twelve was meant. This motor has a bore of 3 in. and a stroke of 5 in., a ratio of 1.66.

The engine characteristics in other words, have had as much to do with the problem as mere displacement. If this were not true, the 300-in. cars could not have held their own with those of almost double the piston displacement on the race course.

The displacement you give is the correct figure and the compression pressures as you state are in absolute reading and not gage.

Dimensions of Buick Light Six

Editor THE AUTOMOBILE:—Kindly answer the following questions:

1—What is the bore and stroke of the new Buick light six, and what is the official record of miles per gallon of gasoline and the speed limit?

2—What is the speed limit of a stock Ford?

3—What is the highest speed ever obtained from a National stock car?

4—What car manufacturing company, if any, has adopted the new Weidely twelve-cylinder motor, announced in THE AUTOMOBILE for Aug. 19.

5—Is the fourth speed of 1911 four-cylinder White direct drive, or above, and if possible give illustration of how these gears shift. I do not know the exact factory model of this car but it is about 40 hp. and about 114 in. wheelbase, five-passenger car.

6—Is it still possible to secure a Shanhouse motor suit from the firm of this name of Rockford, Ill.? This is a one-piece garment used by motorists instead of an overall suit.

Norfolk, Va.

I. A. S.

—The new Buick small six has a $3\frac{3}{4}$ by 5 motor. On page 587 of THE AUTOMOBILE for Sept. 23 appears an account of an official fuel and speed test made with this model in Chicago.

2—Speed limit of the Ford is between 45 and 50 m.p.h.

3—The National stock car won the Indianapolis Race with Joe Dawson driving in 1912, the average speed for the 500 miles being 78.7 m.p.h. Whether this is the highest speed ever obtained from a National stock car or not cannot be stated. This however, is an official record and represents the time over a 500-mile course.

4—The Weidely twelve motor has only recently been announced, and up to the present time THE AUTOMOBILE has no record of any one having adopted it as stock equipment.

5—The fourth speed is above direct and should only be used when the car has obtained a speed of 20 m.p.h. or better. Shifting is shown in Fig. 3.

6—Yes. This concern is still actively engaged.

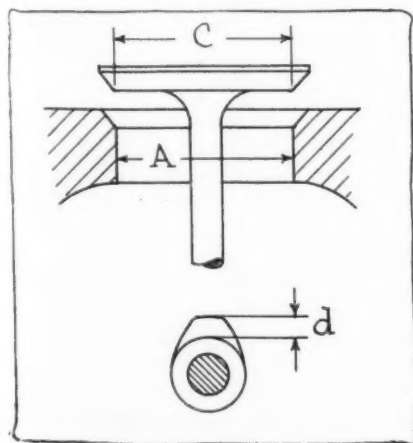


Fig. 1—Pierce valve dimensions, see letter

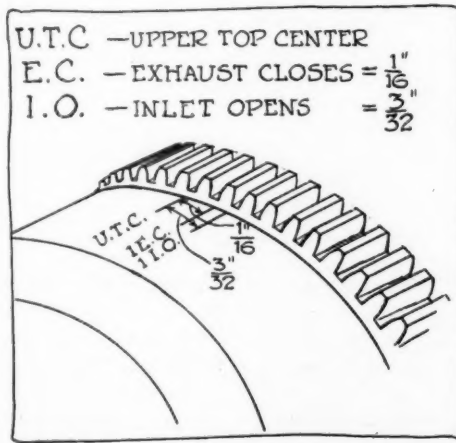


Fig. 2—Timing of Model 19 Buick

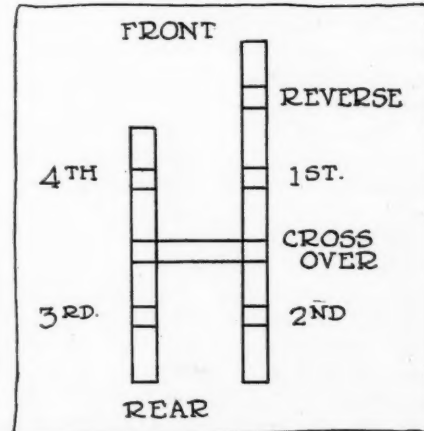


Fig. 3—Shifting order in White 1911

The Car That Stays Young

By M. C. K.

(Continued from September 16, page 519)

MUCH like a complicated character in fiction, the idea of The Car That Stays Young does not crystallize perfectly until it has been viewed from many different angles. The car is not the same when it can be expensive as when it must be cheap. No definition fits it exactly. It is not the car with minimum depreciation, because that quality may have been secured at a cost of production which is too high for what is gained or at the expense of efficiency or economy in service. It is not necessarily the same for one owner as for another, since city and country, mountains and plains, rough high-speed service and easy low-speed service require different construction features to afford equal values. Even the term "value," meaning the sum of desirability divided by the total cost, does not represent an idea which is quite parallel, since value may be found to exist through a lucky chance, as where radical construction features turn out well though insufficiently tried. A judicious conservatism marks The Car That Stays Young, but there is evidently a point where it must be more satisfactory to accept the risk of a promising innovation rather than the admitted and proved shortcomings of that whose place it takes, and in such cases the criterion may be: Whether it is quite clear that the innovation cannot react detrimentally in some unexpected manner upon other features in the car's construction or operation, and whether a mistake might be corrected inexpensively. Left side drive was, for example, at one time an innovation which had to be accepted cautiously, as it affected motor arrangements and, once adopted, could not be changed. Whatever influence it had on durability and the continuance of attractive appearance was not obvious, but such an effect might be traced to a better chance for avoiding side swipes in the traffic and to a certain simplification in style due to the removal of levers and quadrant from the outside of the vehicle. The elegance of The Car That Stays Young must usually depend on simplicity in lines.

Data Kept in Obscurity

Some current phrases throw a rather illuminative side-light on the true character of The Car That Stays Young, as when the manufacturer frequently summarizes his claim for having done the utmost that his selling price allows him to do for his customers in the way of value and durability under the blanket guarantee of "careful attention to details," while it may be perfectly understood, and even agreed upon, that he first of all "gives the public what the public wants." All important progress in the durability of cars and in reducing the cost of car values has come by the opposite process of producing what the public ought to want and marketing it as fast as the public can be persuaded to want it.

In the gap between the car which the public is supposed to demand at some given price—presumably judging its desires from its past purchases—and The Car That Stays Young and can be sold at the same price, in each instance, there must be a considerable mass of data receiving scarcely any publicity, as they relate to those things which the public according to the evidence of the market does not expect or demand and among which each manufacturer cannot afford to champion more than one, if it is conspicuous, or two or three, if they are of a minor sort and can be slipped into

the ensemble of an otherwise orthodox vehicle without too brazenly braving the public's supposed preferences. Where durability is the main point in the issue the publicity needed for making the public perceive its own best interests suffers further from the unexciting nature of this property which can be demonstrated only in the tamest terms and figures and rarely can be illustrated except by showing the lack of durability of something else—which would be "knocking" and is justly tabooed as an ungracious method of conveying information outside of confidential communications.

Although the subject is somewhat elusive when referred to in generalities, it may perhaps have been made clear that "careful attention to details" mainly concerned in "what the public wants" produces a deadlock against substantial progress and in favor of appearances; that is, in favor of making a \$1,000 car look like a \$1,500 car, a \$1,500 car like a \$2,000 car and so on throughout the scale of prices, with the inevitable result of forcing into relative obscurity the efforts and improvements which the public would appreciate if it knew or studied the facts but which under the circumstances can be made only piecemeal here and there and must make their way to recognition against the resistance of the industrial trend at large. Masters in the arts of publicity manage, to be sure, to demolish some of the fortifications of *status quo* where important innovations in engineering are concerned, as one such can justify an expensive publicity campaign and confers a profitable prestige if it "gets over", but with regard to the minor things whose importance lies in their aggregate and which are not aggregated in any one car but scattered among many, it does not seem possible to doubt that they must suffer where the tendency to "give the public what the public wants" prevails, and that there is occasion, therefore, to coddle them by gathering them in one fold as the attributes of The Car That Stays Young and according them a special publicity in one place. From this viewpoint The Car That Stays Young is revealed as the car which no manufacturer can afford to build in all its eventual completeness and variety—until it has become better known.

In the midst of a gigantic but unorganized industrial and commercial activity for producing and selling motor vehicles of all sorts, there should be room for one co-operative effort in favor of all the inconspicuous, and therefore neglected, virtues which it may be found possible to instil into a car, independently of the supposed momentary expectations of the public. It might also be found that these expectations are now usually diagnosed too cynically and that both home and export trade would respond heartily to a special cult of The Car That Stays Young—a cult which depends upon publicity collected in one place and the volunteering of detailed information to build up the Technology of Durability in Motor Vehicles.

A page will be kept open in THE AUTOMOBILE specially for data of this nature, under the caption: The Car That Stays Young, and contributions to these studies of durability are invited.

Remarks made in the two previous instalments with regard to fenders and running-boards, radiators and the means for their protection, mufflers, exhaust pipes and running-

board aprons, motor hoods and the positions of wheels have indicated some of the more important features with regard to which the public's expectations seem to clash with the substantial interests of everybody. For the present there remain only to be mentioned briefly a number of features in which early aging is often observed, while fairly numerous exceptions seem to prove that there are ways to avoid this result without sacrificing style or efficiency or increasing the cost of production perceptibly or at all.

Footboards and Pedals

Rusty pedals and pedal slots bear witness of thinly galvanized cast iron in the pedals and slot linings, and footboards showing wear from the foot soles in spots indicate the error of using a mere surface coating for the boards in a place where wear is unavoidable. Even linoleum is not as a rule of uniform texture and coloration all through, and the wear is therefore plainly visible. In taxicabs the boards are often only painted black and the slots are unlined, but there can be little objection to this economy for public cabs, as the systematic maintenance provides a new coat of paint when needed. For private cars the very general practice of employing single-color fiber sheets with brass fastenings and slot linings leaves perhaps little to be desired for cars with front doors and with cowls over the dash, in which the more or less tarnished brass trimmings are not conspicuous, but bronze suggests itself as more tasty and suitable under other circumstances and for higher-priced cars, and probably something better than galvanized iron could be devised for cheap ones. Rusty pedals, as well as crumpled fenders and running-board aprons cracked wide open in their front and rear seams, must eventually get into the same category as frayed trousers in the popular estimation and will then be held as evidence of sloth in people who can afford automobiles.

Public opinion has moved faster in Europe, in this respect, than here and even begins to hold dusty highways of the old kind against the counties which still tolerate them, especially in England. The automobile is no longer in itself an acceptable excuse for neglected appearances, and competition in providing the means for maintaining them is getting correspondingly keener—or was showing this tendency before the war interrupted the flow of minor industrial ideas in the European countries.

Motors and Their Mounting

With reference to types of motors, the inclosing of their organs, their relations to the clutch and gears and to the fan and radiator, their suspension in the frame, the material of the crankcase, the drip pan or its omission, the type of clutch and a host of detail features in the whole power plant, it is evident that the questions of durability and of noises and troubles due to wear are too numerous and complicated to be considered under the caption of *The Car That Stays Young*, since most of them are still subject to technical discussion and inseparable from the motor design in connection with which they arise. On the other hand, while the motor organization in its decisive features must be worked out by the manufacturer on purely technical grounds, the public taking it or leaving it mainly upon faith and reputation, it is noticed that recently questions of durability and silence of the power plant have been publicly discussed on an equality with efficiency and power—as advantages, for example, in worm gears and valveless motors—but that little is yet done to explain those relatively simple and untechnical expedients by which one power plant is made to give more lasting and regular service to the car owner than another which from all the principal engineering viewpoints is of the same kind.

Taking the motor, clutch, gear and driving system for granted, with brief characterization of it in each case, what

has been done to make the repairs simple and inexpensive and to have the whole plant work as well five years hence as to-day? An answer to this question separated from all considerations of efficiency, power, strength and convenience in operation would throw light on *The Car That Stays Young* if repeated with reference to a number of different power plants of each general type. The public cannot tell if a part is made of alloy steel or a bearing member has been casehardened or how well it has been hardened and polished. Assurances on these points count for little. But it can appreciate if bearings are bushed and if the bushings can be easily replaced. It cannot judge safely as to whether a multiple oilduct system, supposed to take care of a number of bearings, is really dependable, but it can be induced to look for an oil filter and other protection against dust and grit (without which safeguards a shaft running in a bushed bearing might be worn down more rapidly than the bushing), and it can appreciate having only a few oiling places to watch and keep time on. It may not be able to see trouble ahead where shearing strains on rivets are aggravated by frame weaving—as they may be through the manner of mounting a motor—but it can be made to guess the value of visible precautions in this respect if they are pointed out; the public being always understood as including the sales agents who in most cases act somewhat as the guardians of their patrons.

It seems probable to the writer that a great many valuable data on the durability of the power plant and its organs—from the radiator to the brakes—could be brought to the surface for public appreciation, if those most closely associated with designing and testing would present their experiences and information on this subject with a minimum of reference to the engineering data which are usually in the foreground and occupy the space but with distinct relation to cost of production. No doubt, some surprises might crop out in the way of showing the simpler, cheaper and perhaps lighter construction more durable than a more pretentious one, but more often the data would probably tend to demonstrate that *The Car That Stays Young* in its power plant must be designed with a large number of special and more or less costly provisions against wear and deterioration. The most interesting point of all is in reality that nobody can tell in advance what such data will show, as they have never been separately gathered and compared, and they might furnish strong clues to improvements. It may be found true that the power plant by virtue of replacements of parts is the most durable portion of a cheap car in one sense of the word and must be so, because no marked deterioration can be tolerated, and there may be suggested ways to extend the replacement system to those portions of a car which are now usually permitted to go on aging to the end like a suit of clothes.

Wire and Wood Wheels

If there is a decisive difference in the merits of wire and wood wheels it probably depends on climate, type of car and construction details in both the wire wheel and the wood wheel. A moist and hot climate and a fast car used roughly seem to predicate the wire wheel, while for other conditions the choice at present becomes mostly a matter of taste and style—with the questions of manufacturing facilities and finality in construction looming up large in the background as determining for car producers. The wire wheel has not yet been back in the American market long enough to establish a comparison on an equal footing, but the department of *The Car That Stays Young* will afford an opportunity for illustrating the public's experience with it, so far as durability, economy and appearances are concerned. Some very interesting data and opinions should be forthcoming bearing on the competition between demountable wire wheels and wood wheels with demountable rims. With reference to a

durability choice at the present moment, it can scarcely be in the first line of importance, as the writer has not for a number of years seen a car in operation that was disgraced by its wood wheels or one that was disabled by its wire wheels. A wobble is practically always in the spindle or axle or in the steering.

Steering Linkage

According to generally accepted practice the joints in the steering linkage should be as few as possible, to reduce the aggregate wear and play with the resulting noise and wobbling, each of them should be lubricated, those of the steering rod should be cushioned and held tight with buffer springs whose size and tension should correspond to the weight and speed of the car, those at the ends of the tie rod should be arranged so as never to give any perceptible play, either by means of adjustment or strong buffer springs, the tie rod should be capable of yielding enough—when wheels get wedged between ruts, for example—to avoid buckling the rod. Formerly tubular steering rod and tie rod of ample diameter and gage were considered indispensable for combining rigidity and light weight, and tube stock is still preferred for the steering rod, but now tie rods are usually solid and shaped with bends that permit a yield, especially when located behind the axle.

The durability of steering linkage varies notoriously and, as the above mentioned forms of practice leave room for a number of variations, it may be found possible by comparing notes to account for shortcomings without theorizing about the causes.

Seats, Seat Springs and Upholstering

A very large factor in the average car owner's satisfaction or dissatisfaction with his vehicle after its first six months of service comes under the head of seats, seat springs and upholstery, and no other features depend so completely on the public's common sense in adjusting their demands to the price which they are willing to pay. In a general way, the more movement and conforming are demanded of a seat the more rapidly it will become shabby and uncomfortable and the more art and money's worth will be required in its construction to make it last. And the more the movements of springs, stuffing and covers are localized the smaller is the chance for durability. Seat makers have not yet been accustomed to give technical consideration to specific pressures—pressures per square inch—elastic limits, permanent sets and fatigue or stretch of the materials with which they operate. They build to price with the old data of their art which were mainly based on stationary seats rather than seats required to work hard most of the time while in use. Recourse to real leather and real horsehair is neither sufficient nor economically available, and near-leather fabrics, being much improved here and much cheapened there, are uncertain materials so far as the public can tell. Discriminating engineering in co-ordinating the spring elements, if it exists in notable degree at all, needs a public airing, not only for the sake of developing it but to make clear the reasons for variations in the cost.

In front seats which are reclining and high under the knees, yet 12 inches deep in upholstery, the springs at the rear which support almost the entire weight of the driver, or his companion, are nearly always broken down, which is so much more natural as they are even required to work obliquely, and front seats of this description are not for The Car That Stays Young. The remedies are mostly obvious, however, awaiting only the public's insistence on having them applied. Probably almost any style of seat could be produced by rational compromises in the matters of economy, durability and permanent appearance. But for this purpose the free and public exchange of data seems again to be what is mostly wanted. For example, does anybody know of a

deeply upholstered seat in a \$700 car that remains presentable and comfortable after one year of average service? A description of its construction and materials with approximate cost of production would be valuable.

Doors and Hinges

Something about doors and the way they are hung proclaims class, but the subject is passed up here as too subtle. Still, the old and common solution consisting in making low-priced cars slab-sided and the doors flat does not seem final for a pleasure vehicle in which some grace of lines is expected. To make a car homely to have it Stay Young is soon found too much of a sacrifice when the eye gets tired of the homeliness.

Paints and Colors

To pick out of the intricate technical subject dealing with paints, enamels and varnishes something which we can all fully understand and apply in the purchase of a car or in estimating its probable durability, is probably beyond the possibilities as well as unnecessary. The chemistry of paints is advancing; the micro-physics likewise and it is possible to "cover" a metallic surface now in any one of several different tints and have the coating exceedingly thin, adherent, hard and attractive, so that baked enameling can be more and more dispensed with. Chemical coloration, including gun metal finish (which is scarcely rustproof, however) is also being industrialized for large-scale work. Expensive cars are seen in ever growing number on which there is no baked enamel or varnished paint in many slow-drying layers and which can be groomed without the caretaker going to school first with the old-time coachmakers. The art is developing satisfactorily, in other words, for car owners and for The Car That Stays Young. Only in the finish of close cars are the traditions still dominant though gradually giving way to the practical needs for a vehicle that is much more exposed to hard usage, dust and mud than were even the stage coaches of old—and they were simply painted.

What seems mostly to be required in the data on paints and colors for The Car That Stays Young, whose equipment or finish cannot be of speculative value, is a separation between the actual and the supposed requirements, between the actual means at command for producing a suitable, durable and renewable finish and those still frequently employed solely to "please the public." The public is already showing its willingness to do the rest.

Leather and Its Substitutes; Cloths

When material is tufted which is not adapted for tufting, and which is not recommended for tufted upholstery by its makers, one must expect to find the folds worn threadbare in short order, and of all the avoidable features which make a car prematurely old in value as a luxury a threadbare leather substitute is among the commonest. In some foreign markets, such as those of South America, it is reputed to be fatal to the continuance of trade.

Cloths, being by nature flexible and showing little difference in texture and colors whether new or worn, would probably be uniformly preferred were not the question of waterproofing in the way. This one problem, for which a number of more or less satisfactory solutions can be imagined offhand, may be singled out for the attention of the best informed, in the belief that it already HAS BEEN SOLVED in a manner more acceptable than the use of materials can possibly be which get old and grimy by a few months of exposure to wear, dust and sunshine. For the completion of The Car That Stays Young though not expensive, data on this point seem indispensable.

Lines of Wear

When a car has been handled much in public garages, and perhaps under other circumstances not so easily traced,

certain lines of wear make their gradual appearance, not always in the same places in different cars but apparently according to the chances for receiving bumps or abrasions or the imposition of oily hands. The question seems to be one of maximum exposure for certain portions of the car.

If there is a remedy and it is simple it ought to be known.

With this mere outline of obvious ideas for The Car That Stays Young the writer hands over the subject to all those who are in possession of useful detailed data on Durability and Its Relation to Cost and Style.

Weak Spots Brought Out in German Trucks

DURING the German campaign in Russia last spring not only the soft roads were found impassable for heavy loads but highways which were apparently macadamized were revealed as merely thick layers of broken stone in many places laid on a miry foundation which the thaw released from its frozen bondage. The war trucks constantly broke through this undulating stone carpet, and their construction was sorely tried. A German engineer who made it a point to look up the troubles arising from this cause reports on the subject in *Automobil-Rundschau* for July with the avowed object of enabling the manufacturers to correct the weaknesses discovered. Mentioning firm names only if their records were found especially favorable, he makes in substance the following statements:

It was soon proved that the wagons of each and every firm have a special weakness. The commonest effect of the Russian roads was spring fractures. Practically none but front springs were broken, however, and these only in two characteristic places; namely, close to the front pivot exactly at the end of the first leaf adjacent to the single or double main leaf and, secondly, a few centimeters in front of the clip—rarely at the hole between the clips. Notably few fractures occurred in Daimler springs, which appear to be ground with unusual care. It happened that the spring forging at the front end of the frame was forced deeply into the road when a fracture took place.

Solid rubber tires of the most reputable makes gave out rapidly, but this was expected, being ascribed to the rubber famine.

Fractures of front axles occurred only with bent axles and only at the bends.

The manner of securing spring pivots and shackles to the frame was not always found substantial. In the case of one firm the lug carrying the rear spring shackle came loose regularly. It was joined to the lower frame flange by six rivets, and the rivet heads came off.

Ball bearings gave little trouble, excepting that neglected lubrication frequently caused abrasions in the ball bearings of front wheels in personal cars. In a few instances ball bearings in the gearbox were broken and caused great damage. A seized ball in a rear-axle gear ground pretty concentric rings into both bevel wheels.

Damage to radiators by collision is largely warded off by a fender rod in front of it. Nevertheless the radiators received

innumerable injuries from diverse causes, including bullets and shrapnel of course. The field repair consists in soldering with tin, but pounds of tin are sometimes needed for reaching a small hole. In Büssing trucks flat brass tubes, vertical, take the place of the cellular system, and they have considerable strength and can be easily replaced when damaged. Only a few firms use similar construction.

Long-stroke motors were generally found preferable. One firm has placed the upper piston ring too close to the top of the piston, and the edge of the piston was often broken. Melting of crankshaft and connecting-rod bushings was too frequent; also ovalizing of crankshafts in their bearings. The melting of bushings was ascribed by some technicians to lack of viscosity in the lubricating oils, whose quality has suffered under the war conditions for lack of the usual supplies. But another explanation lies in the strong vibrations of the shaft which occur with long-stroke motors of high speed unless each crankpin is balanced by counterweights in its own transverse plane. This is too seldom done.

In motors with valves controlled from the top, which were found desirable in general, a considerable advantage was noted if the valves were vertical, as those operating at an angle frequently had to be taken out and cleaned.

Complaints of drivers had seldom any other object than the carbureter. One repair unit met them by ordering one hundred Pallas carbureters and regularly installing them in the place of those found faulty. These were uniformly designed and made by the car manufacturer. The specialists do better. The aviators, whose lives are staked upon the correct functioning of the carbureter, show marked aversion to one aeroplane in which this accessory is unreliable.

A truck whose rear-suspended fuel tank has no dents is a rarity. Many of them have a road clearance of only 25 to 30 centimeters. A strike against a stone frequently finishes them. The reduction valve is often clogged, and the need of keeping the tank and its tubular connections airtight, coupled with the introduction of impurities in the fuel from the exhaust gases, does not increase the popularity of the pressure-feed system.

An improvement in new two-wheel trailers, each for the transportation of three wounded where the roads permit, consists in replacing the ordinary hook-and-eye coupling, which allows too much lost motion and therefore too many sharp jerks, by a ball-joint device supplemented by a hinged brace.



Two views, showing part of one shipment of American trucks sold to Great Britain for war purposes. The trucks are of three makes, Locomobile, Packard and Peerless. The photographs were taken "Somewhere in England"



Three of the Owen cars on the run traversing one of the typical mountain roads in Massachusetts

THE first public long-distance demonstration of the Owen magnetic car was made last week when the company made a tour of over 800 miles from New York City north through Albany, Lake George and Plattsburg, around the northern end of Lake Champlain, and back to New York by way of Burlington, Rutland, Manchester and Pittsfield. Five cars made the trip, these carrying press representatives from New York City. The tour was expressly for the purpose of showing what the Owen car, with its electric transmission instead of the conventional clutch and gearset, will do on all kinds of roads.

Typical Touring Route

The trip was over a typical route which led through the heart of the Adirondack mountains and also through the Green mountains and the Berkshires. There were long, steep mountain grades, and long descents. One day of heavy rains was encountered. The trip incorporated typical touring conditions so far as weather and roads were concerned.

The five Owen cars gave as good a demonstration as could be wished; in fact, there was nothing that savored of unfavorable performance in the entire 4000 miles total covered by the five cars. The cars were driven nearly half of the distance by press representatives in order that they might get a correct gage on their performance. These representatives invariably handled them through the mountain sections where difficulties would be most likely to arise if such were to occur.

Features of Driving

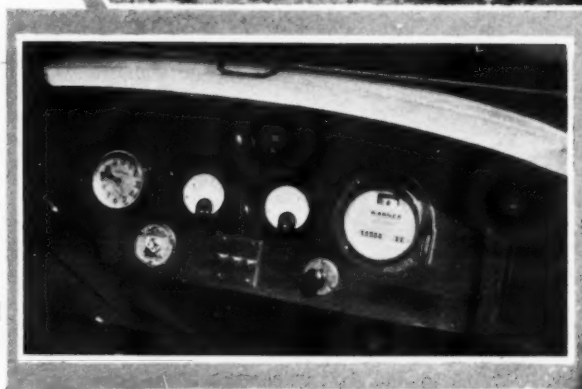
In driving a magnetic car there are many entirely different conditions met with, all of which are highly favorable to the electric type of transmission. Foremost come the pleasant coasting qualities. When descending a hill the car can over-run the motor at will, the same as in a conventional car with a gearset when the clutch is released; but in the magnetic this coasting occurs automatically, the driver not having to do anything. When the driver wishes to bring the motor again into use when the coasting is nearly finished there is nothing to do but press the accelerator and the car moves on without the slightest jerking.

Demonstrating the O

Five Cars Make 800-Mile Run Thro



Circle—Steep climb over a creek bank, the road through the field being overgrown with grass. This gives an idea of the kind of going to which the cars on the run were subjected



Below—Instrument board on Owen magnetic car. The two center dials are ammeters, the left showing the rate of battery charge and the right the torque of the gasoline engine of the car in amperes

Another pleasant feature of driving is the electric brake in which the braking is accomplished by the electric motor on the propeller shaft, this motor being converted into an electric generator which produces electric current when the brake is applied. This brake is applied by the small controller handle above the steering wheel which gives the different speed ratios of the electric transmission system. It is only necessary to move this lever, which is little larger than the throttle or spark lever on the conventional car, to what is called the neutral position, to apply the electric brake, which very rapidly reduces the speed of the car to 15 m.p.h. on the steepest grade and holds it there. In one descent over a mile long in the Adirondacks this brake demonstrated its effectiveness perfectly. An excellent feature in connection with using it is that when it is applied the power of the engine is automatically cut off and immediately the brake is taken off the controller lever cuts into the forward

Owen Magnetic

Through Mountain Sections



R. M. OWEN RALPH OWEN

The Owen brothers, makers of the Magnetic car. R. M. Owen is president of the company and a heavy stockholder. Ralph Owen looks after the manufacture of the cars.

these speeds, but you pass along from one to the other progressively. What is known as high speed is used for all ordinary running, and it is only on steep grades that lower speeds are used. In the lower speeds an electric motor on the propeller shaft assists in driving the car, this motor receiving its electric current direct from the generator which corresponds with the clutch, a storage battery not being necessary to supply the current. There is a direct drive on all speeds, the only difference between the high and lower speeds being that there is greater slippage between the fields and armature of the electric motor on lower gears than on high. On high the slippage is approximately 40 r.p.m. when the gasoline engine is operating at 1000 r.p.m. In other words, on a level road the gasoline engine works at 1000 r.p.m., let us say, and the propeller shaft is revolving at 950 r.p.m. In this speed the electric motor on the propeller shaft is not assisting in driving the car. On the lower speeds there is greater slippage between the gasoline engine and the propeller shaft, but on these speeds the electric motor is assisting the gasoline engine in driving. These changes are all taken care of automatically, the only work the driver has to do is to merely move the controller handle and regulate the throttle of the gasoline engine.

Emergency Low-Gear Ratio

The cars are provided with an emergency low-gear ratio between the gasoline engine and the rear axle, which is controlled by a lever. This lower ratio was not needed on the entire trip, which demonstrated that it is practically unnecessary for ordinary touring, although there might be conditions, such as long stretches of deep mud or heavy sand,

speeds as needed. This gives a smooth, uniform change to acceleration.

Seven Forward Speeds

The car is provided with seven forward speeds through the electric transmission, all of these being obtained through the small controller lever referred to. There is no neutral position between

where this would be used. It is not necessary for hill-climbing. On the tour there were long detours in the mountain sections of the Berkshires which led over the worst roads ordinarily encountered on touring, and on these the emergency gear was not necessary for the steepest grades.

Acceleration of the Owen car is particularly rapid, and is accomplished without the noise of going through gears. The controller lever is merely moved through an arc of slightly over 90 deg. There is no pause between adjacent speeds, excepting when high is reached, there is a slight forward impulse.

Most Hills Climbed on High

Nearly all of the hills were climbed on high, the driver only having to give a wider opening of the throttle. When lower speed ratios are used, the greater slippage in the generator corresponding with the clutch and flywheel generates electric current which is consumed by the electric motor on the propeller shaft, this motor then aiding in driving the car.

When driving the magnetic car more or less attention is given to one of the two ammeters shown on the instrument board on the opposite page, namely, that one immediately left of the speedometer dial. The reading of this ammeter is a good indication of the engine torque used in driving a car. When coasting down grade the ammeter dial stands at zero; when pulling on the level road at speeds of 30 or 40 m.p.h. it indicates between 50 and 70 amp., and when the engine is pulling its hardest on long hills on high ratio, it reads at 125 to 150. This ammeter is a fair indication of whether the engine is pulling its maximum. With a missing cylinder the ammeter may not show over 100 amp., which is immediate notification to the driver that everything is not working properly with the gasoline engine.

The ability of the Owen car to operate without a useful battery of any capacity was well demonstrated on the run when old Betsy, the second car built by the company, did not have sufficient battery to crank the motor, yet there was no difference in the operation of the car, the electric system working as if the battery were in a complete state of charge. This demonstrated the company's contention that the battery is only necessary for starting and lighting and not an essential in the electric transmission system.



Above—Four of the five Owen cars which made the 800-mile demonstration run last week

Oval—One of the cars at meal time showing the electric cooking range set up on the running board

ACCESSORIES

Warner Electric Clock

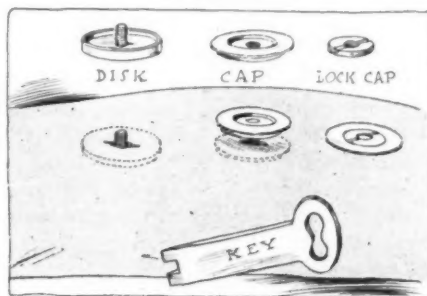
A CLOCK with a seven-jeweled movement is made electrically self-winding, current being supplied by one dry cell or, if so desired, by the electric lighting system of the car. When a dry cell is used it will keep the clock going for six months, and can be changed without handling any wires, the cell making its own connections when pushed into place. The dial is 3 in. in diameter and the figures, which are white on a black ground, are etched in metal. Setting and regulating can be effected without removing the clock from its place. Two models are made, one being of the flush type for dashboard installation and the other for mounting anywhere on the car, but not flush. Both sell for the same price, \$15.—Stewart-Warner Speedometer Corp., Chicago, Ill.



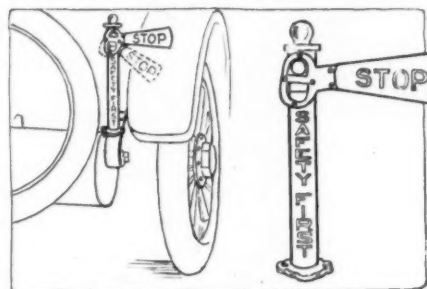
Warner electric clock, showing dry cell attached

Spitler Puncture Plug

This device is designed to effect a permanent repair of punctures and small blowouts without the use of cement, or patches and without vulcanizing or soiling the hands. They consist of a disk with a threaded projection which is slipped into the puncture or blowout on its edge and which covers the under side of the tube or shoe where the puncture or blowout occurs; then, a cap is placed over the threaded projection of the disk so that it covers the outside of the tube or shoe; a lock cap then screws onto the threaded projection, holding the cap in place and being tightened by a key so that it is impossible for the tube to leak. The manufacturers claim that there is no friction between the plugs and the shoe, and that they cannot injure the fabric of the shoe nor the inner tube on this account. There is no pressure on the edges of the plug, they claim, so the latter cannot cut the inner tube. The plugs are made of brass and sell for \$1 per set of four.—Spitler Puncture Plug Co., Inc., New York City.



Illustrating use of Spitler puncture plugs



D. & M. rear signal, showing mounting on car

Wonder-Mist for Polishing

To replace harmful soaps, water or anything containing lye, lime, soda or potash which when dried carries with it the moisture of the varnish, Wonder-Mist has been put on the market. This is a transparent liquid containing no acid, gum or alkali. The oil which it contains is free from fats and is blended by a private process which, according to the makers, is a food for varnish and keeps it elastic.

This fluid is supplied with a sprayer

and is distributed evenly over the surface in a fine mist, the process being to have this oily mist come directly in contact with the dirt loosening it and absorbing it so that where it is removed with dry cheese cloth it leaves the finish clean. About 10 sq. ft. can be cleaned and polished with one teaspoonful of the liquid. The makers claim that this is a large gain since when the polish is poured on the cloth about two-thirds is lost by absorption. Also they state that variations in the amount of moisture in the cloth give unequal distribution of the liquid.

In removing the dirt it is claimed that the fluid introduces a film of oil between the dirt and the finish, allowing it to be readily removed without destroying the polish. It is claimed that transmission grease or engine oil to 1/4-in. thickness can be removed, and road tar is also said to succumb to the Wonder-Mist. The price is \$3 a gal., \$2 for 1/2 gal., and \$1.25 per qt., with sprayer free.—Wonder-Mist Co., New York City.

D. & M. Rear Signal

This signal is designed to render unnecessary signaling by hand the driver's intention to stop, being a simple mechanical device automatically acting on the semaphore principle when the brake is applied, through connection with the brake pedal. The signal clamps on the rear spring, no drilling of holes being required. Working parts are all inclosed and at night the device is electrically lighted. The makers fully guarantee its operation. The signal sells for \$7.50.—Drabold & Mott Mfg. Co., Detroit, Mich.

Sure-Stick Electric Vulcanizer

The Sure-stick vulcanizer is heated by current from any 6-volt storage battery, a special clip and cable being supplied for making the connection quickly. It will vulcanize tube patches and small casing cuts; the makers state that it can be used on tube work while the car is running, saving time in putting spare tubes in order. The clamp can be released and the patch inspected while being vulcanized, and the vulcanizer replaced if the work is not sufficiently cured. Weight, 2 lb. The outfit includes the usual vulcanizing materials, and sells for \$3.—Sackett & Ogden, Columbus, Ohio.

United Camp Cooking Outfit

This camp cooking outfit is especially for the use of automobile parties, the special features of which are the compactness with which the various utensils can be stowed away and the grid on which the pots and pans are arranged, with space below for charcoal or other fire.

The camping outfit, which should appeal particularly to automobilists off for a day's outing, consists of one 8-qt. aluminum cooking pot with cover, one



Sure-Stick electric vulcanizer

7-qt. aluminum percolator coffee pot, one aluminum frying pan with detachable handle, one tin-plated steel meat broiler and toaster, and one tin-plated cam grid and charcoal grate. These things all fold and fit together so that they really take a surprisingly small space when their bulk in unpacked condition is considered. In addition, special canvas cases are provided for carrying them. The cooking pot being the larger, the other utensils all nest nicely in it. The price of this complete outfit is \$7.50.

The United company also sells several styles and sizes of grids separate from the complete outfits. These are arranged to fold flat, with the standards pointed to stick into the ground. With a charcoal grate below the grid, the article is priced at 75 cents in aluminized finish and 95 cents in tin-plated finish. This is the 10 by 14-in. size. There is a larger size, 13 by 21½ in., this selling at \$1.10 and \$1.35 for the two finishes. Then there is the type without the underneath grate, which comes at 50 and 75 cents for the aluminized and tin-plated finishes respectively in the 10 by 14 size. This same thing in the larger dimensions is 75 cents and \$1.—United Steel & Wire Co., Battle Creek, Mich.

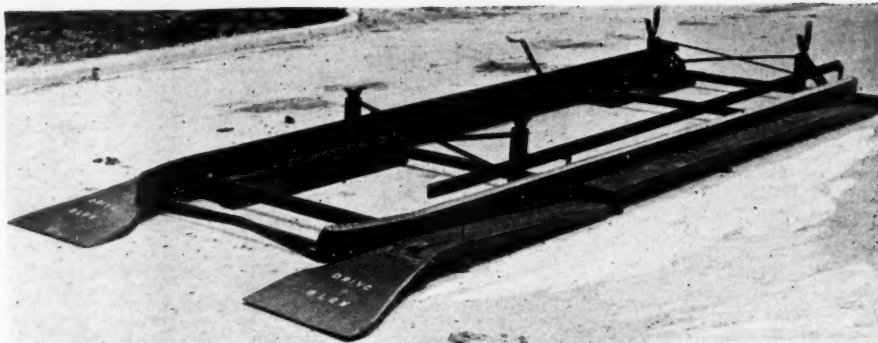
Su-Dig Series Ignition Plug

The Su-Dig spark plug is designed for use with two-spark ignition systems where there are two plugs in each cylinder sparking simultaneously, irrespective of whether the source of current is battery or magneto. The plug is intended to be placed between the magneto or coil and the second plug which may be of the conventional type. Preferably the series plug is placed over the intake valve and the other in the center of the cylinder head, or, if the motor is a T-head design, over the exhaust valve, though this is a matter of union.

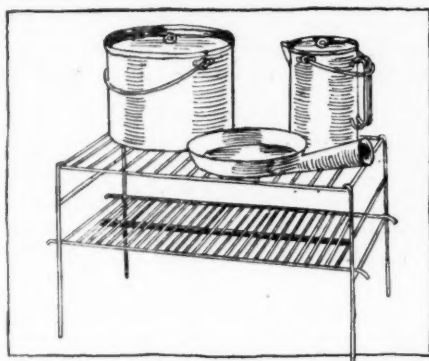
The insulation is of heavy porcelain, and there are two insulated electrodes with two outside binding nuts, the wire from the source of current being attached to one while the other is connected to the second plug which is grounded in the conventional manner. The Su-Dig plugs sell for \$1.50 each.—Superior Motor Specialty Co., Philadelphia, Pa.

Lennon Light Protector

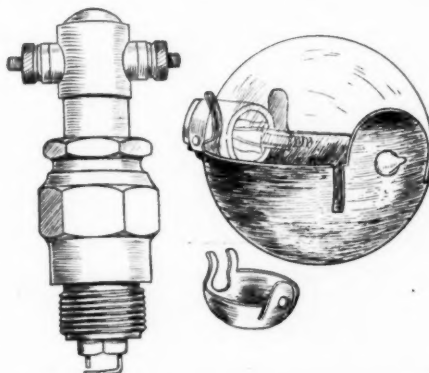
This device is designed to prevent headlight rays from being reflected upward, thus keeping them from glaring into the eyes of drivers of cars and wagons approaching, while at the same time not interfering with the illumination of the road in front of the car. It consists of a nickel-plated spring-brass shield which slips over the bulb, covering the lower half and leaving the upper half clear. The light rays which would ordinarily be reflected upward from the lower portion of the lamp are cut off and



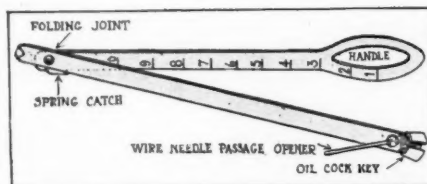
American automatic four-wheel jack, showing rubber-cushioned heads and drop sections



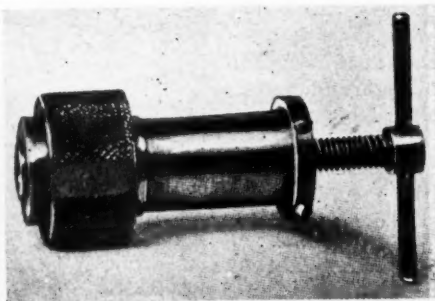
United camp cooking outfit with steel grate



Left—Su-Dig plug for series ignition. Right—Lennon Light Protector which is designed to prevent headlight glare



Manzel gasoline and oil key for Fords



Campbell adjustable bearing puller

only those which are reflected downward on the road from the upper portion are permitted to escape. The price of the protectors is \$1 per pair.—Lennon Mfg. Co., Willimantic, Conn.

American Four-Wheel Jack

All four wheels of the car are run up on runways, which form part of the jack; the axles engage with four rubber-cushioned supporting heads and drop sections under the wheels are automatically lowered when the car reaches the proper position, leaving the tires an inch clear. To release the car a pedal is pressed, when the car moves backward off the jack. Price, \$37.50.—American Automatic Jack Co., Hicksville, Ohio.

Manzel Oil and Gasoline Key

This is a folding tool for Fords, 24 in. long open and 13 in. folded, with an oil-cock key and an oil-cock cleaning needle on one end and a gasoline tank scale marked on the shank. With the oil-cock key the oil-level cock under the engine can be reached and tried without difficulty, and if necessary the oil and other passages can be cleaned out with the wire. The scale on the shank is marked to read in gallons to indicate the quantity of fuel in the Ford tank. Price, 60 cents.—Charles W. Manzel Co., Buffalo, N. Y.

Campbell Bearing Puller

A device for pulling magneto, electrical generator, or other bearings of this type, has often been found a necessity in shops doing work on electrical apparatus. With this device it is simply necessary to slide a large knurled ring back toward the handle of the device, allowing the jaws to expand. The puller is then placed over the bearings and the ring again pushed back toward the bearing, which will lock it in place, after which the bearing can be pulled out by turning the handle screw to the right. The puller is adjustable to different sized bearings without any other tools, which makes it a valuable device, since it is self-contained. The material used is steel throughout. The device sells for \$10.—Campbell Auto Works, Stockton, Cal.



Left—Before Cadillac eight test on Chicago speedway. S. D. Waldon drinking milk. Also shows Ferdinand Jehle of A. C. A. and drivers W. J. Davidson and Philip Robertson. Right—Cadillac eight averaging 72.49 m.p.h.

Cadillac Eight Touring Car Goes 100 Miles in 82 Min. 46 Sec.

DETROIT, MICH., Sept. 27—In a test run just made on the Chicago speedway under the supervision of the Automobile Club of America, an eight-cylinder Cadillac touring car, fully equipped and carrying a spare wheel and tire, covered 100 miles in 82 min. 46 sec., or at an average speed of 72.49 m.p.h. Windshield and top were down. The fastest lap was made in 1 min. 38 $\frac{2}{5}$ sec., or at a speed of 73.17 m.p.h., a new record for touring cars.

Two cars were tested, one a new car out of regular production which had never been run prior to being driven to Chicago from Detroit. It had covered 345 miles when the tests began. The other car had been used for experimental work, but the

first made the better time, although by only a small margin.

Both cars were put through 100-mile runs, and their performance was strikingly uniform, the new car beating the older one by 1 min. and 30 sec. for the 100 miles. Each car was also given a 1-hr. test, the new car traveling 72.41 miles in that period, which was 1.35 miles more than the other ran in an hour.

The older car traveled the 100 miles in 84 min. 16 $\frac{4}{5}$ sec., or at the rate of 71.19 m.p.h. The two cars made a total of 200 miles in 167 min. 2 $\frac{4}{5}$ sec., also a touring car record for this country. The drivers were members of the Cadillac organization.

Indiana S. A. E. Talks Twelves and Aluminum

(Continued from page 602)

the single carburetor is the practical arrangement for all touring car purposes so far as we know at the present time. If you are building a motor for the highest possible speed, then you may use a double carburetor or even more carburetors. I believe four would give more power. In fact, I have a twelve-cylinder Sunbeam with four carburetors which performs very well at high speed but not very well at low speed. As to the gasoline economy, I made an official test in Chicago on the board track—which doesn't mean anything—which ran 13 miles to the gallon, at an average speed of 30 m.p.h., or just over that, thinking that would represent ordinary touring speed. By leaning the mixture one notch on the dash control I could have made fifteen, but it would not have been good business, as it would not be the way a customer would drive the car.

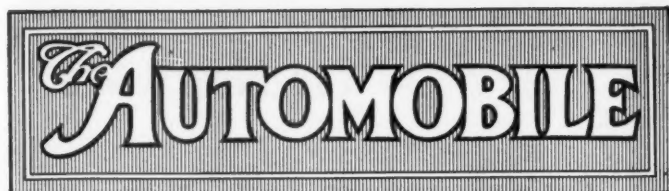
"I think every engineer has had experience at some time or other with some fellow who was some sort of a mechanic and would get possibly twice as much mileage and get it consistently, but he would be proud simply of his mileage and would not care for his car to run smoothly and sweetly. Now, the best information I have as to how these cars are going to run under actual conditions is the record of the demonstrators. I have taken the record of the demonstrators which have run several thousand miles and naturally as a technical man would, I have kept track of the gasoline consumption and the grand total is an average of 10.2 miles per gallon. That has been done under demonstrating conditions,

where the car was idled, where it ran slowly, pulled hills on high, and where high speed had to be shown. It was about average running conditions to the customer. Some customers will have more favorable conditions and some average conditions will not be as favorable. I try to keep away from giving actual figures on gasoline economy because I have found figures vary too greatly and you cannot be sure the customer will get the same mileage you can, unless you make it absurdly low.

The compression is about 19.5—that is, the combustion chamber is 19.5 of the total volume. We take our compression at 120 r.p.m. and in our case it goes to 75 lb. compression."



Cadillac eight on straightaway on Chicago speedway during tests



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The Vindication of the V

THE paper on the twin six engine read both at Detroit and at Indianapolis by J. G. Vincent has been remarkable by reason of the fact that it has stirred up no opposition, no real criticism, in the discussions. If the Packard twelve had appeared a year earlier, if Mr. Vincent's paper had been read simultaneously with D. McCall White's on the eight last winter, what a storm of disbelief would have been raised!

That the earlier paper raised so much excitement while the later one is treated rather as a matter of course is certainly due to the complete success of the V motor principle as applied to modern engine designs. There is now no longer any opportunity to express disapproval of the duplex connecting rod, the carburetion or ignition layout, the cooling or the power output of a V motor *because* of its being a V.

There are plenty of engineers who hold that four or six cylinders properly applied can give as good results as eight or twelve, and it is very interesting to observe that their ideas do not seem to make good material for discussion in a meeting. It is now clear that early objections to the "complication" of V motors have been overcome, that the strongest engineering objections were matters of mechanical detail rather than of principle, and it is a remarkable thing that the engineering outlook should have changed so much in so short a time.

Speedways and Engineering

PROBABLY the Indianapolis speedway has this year been the scene of more testing work than ever in its history, excepting tests made solely for racing purposes, as visitors from Detroit have made great use of it in addition to the permanent usage of the Indianapolis manufacturers. Not only this, but the Chicago track has also been employed for tests that are demonstrations, or demonstrations that are tests. All this activity on the speedways is serving to again demonstrate their immense value to automobile engineers as testing grounds.

A really good track in Detroit, owned by the manufacturers of Detroit and intended for testing rather than for racing would improve the average Detroit product at least 20 per cent within a year or two. It would be worth the while of every manufacturer to put down a good sum and contribute an annual income for the building and upkeep of such a track and it is remarkable that a scheme along this line has not yet developed. But there is another side to the speedways as well as testing and racing, and this is their value for demonstration performances such as the recent speed tests of Packard and Cadillac at Chicago. There is hardly a member of the industry who does not agree that cars will be sold more and more on performance and less and less on specification, so the value to a manufacturer of officially observed tests is immense, from the publicity viewpoint.

With the speedways thus tending to assist the manufacturer by helping him to improve his cars by private test and to demonstrate the result by public test, the owners of the tracks have a right to ask the automobile manufacturers to be a little more generous. There are two ways of enabling the speedway corporations to make a reasonable trading profit, one being a wider use for testing and a slightly higher rate of pay for demonstration runs, the other to build more racing cars and help to make American cars that will beat and replace the foreign vehicles. The public will flock to see racing just so long as that racing is good racing, and it cannot be good without the annual production of good speed cars, for the old ones cannot be used again and again.

Speedway Opportunities Neglected

Recent developments in speedway circles show that this is realized, but the making of racing cars is not a task lightly to be undertaken, and it is impossible to hope for more than a moderate number every year. This being so, there is a growing feeling that the increasing public interest in automobile performance will re-create the stock car events. To devise stock car rules is not impossible, and that the public would be attracted to see stock car racing is incontestable. Then, too, there are one-make races which will always draw every owner of that make from miles around and there are other things as well. If every member of the trade would give a little time to thinking on the subject, would realize what an immense asset the speedway is to his business, we should soon have schemes enough afoot to utilize the speedways properly and profitably.

France to Declare 45% Tariff

American Cars Imported Into French Territory to Pay—War Orders Exempt

PARIS, FRANCE, Sept. 27—*Special Cable*—On good authority it has been declared that France will shortly follow the lead set by England, by declaring a duty of 45 per cent on all American cars sold into France or its possessions. This new move is looked upon as a protection measure of the French automobile manufacturers against the American industry and also as a source of revenue. America has a tax of 45 per cent on French automobiles imported costing over \$2,000 and of 30 per cent under \$2,000. The present action of France exactly reverses the situation. At present the duty on American cars entering France is 75 francs per 100 kilos, or \$15 for every 220 lb. On a car weighing 3000 lb. the duty is \$225. On the 45 per cent basis this duty will be nearly \$700 or more than three times what it is at present. This duty will not affect war orders of trucks or automobiles, but will have a serious effect on American manufacturers retaining agencies in France.

Heretofore England, which has been the greatest purchaser of American cars, has been a free trade country, requiring no duty whatever on American cars entering the British Isles. The present duty of 33 1/3 per cent entirely changes the aspect of American makers so far as export business is concerned.

Moline Plow to Build Cars

FREEDPORT, ILL., Sept. 25—The Moline Plow Co., has decided to abandon the construction of buggies in one of its two plants here and, instead, will construct automobiles. The demand for carriages has dwindled rapidly with the increase in automobiles and it is likely that the company will gradually make the shift in other plants as business conditions warrant. The officers of the Moline company are now planning the model for their automobile construction and may reach a definite conclusion during the coming fall or winter.

Kelley Maxwell Consulting Engineer

DETROIT, MICH., Sept. 28—William Kelley has rejoined the Maxwell Motor Company's staff as consulting engineer with especial duties in adapting car design to manufacturing facility.

Moloney Gibney New York Manager

NEW YORK CITY, Sept. 29—Edward F. Moloney has joined the forces of the Gibney Tire & Rubber Co. as manager

of the New York branch. He started in his new position Sept. 27 with complete charge of sales in the New York territory under the direct supervision of General Sales Manager C. A. Gilbert. Mr. Moloney was formerly manager of the solid tire department of the Firestone, New York branch.

Sales Manager Gilbert has left for the Coast to establish a branch in San Francisco that will take care of the growing truck tire business West of the Rockies.

American Car Agents in England Oppose New Tax

LONDON, ENGLAND, Sept. 24—It was declared to-day that the 33 1/3 per cent ad valorem import duty on all automobiles and their parts will at present affect only the American manufacturers. The purchasers of American cars will have to pay the new duty, except in the case of one low-priced car. The manager of the London office of this firm explained that only one-third of each car of this make sold in this country comes from America so that duty has to be paid only on one-third of the value of each car.

Several other American cars, however, already have put up the price, one of them being raised \$235, while a more expensive car has gone up from \$2,300 to \$3,000.

Representatives here of American automobile firms are strongly opposed to the new tax urged by Reginald McKenna, the British Chancellor of the Exchequer. A reduction of 15 per cent will be asked.

Anderson Reports Good Conditions

DETROIT, MICH., Sept. 29—Lee Anderson, sales manager of the Hupmobile, who is on the coast, having driven from Chicago there, reports that there is more automobile business in the West than the manufacturers can possibly supply this year. Dealers are generally short of cars and the demand everywhere is exceptionally great.

Joyce Leaves Kelly-Springfield Truck

SPRINGFIELD, OHIO, Sept. 25—James Joyce, for two and one-half years Eastern manager of the Kelly-Springfield Motor Truck Co., this city, has resigned to become Eastern manager of the Houk Mfg. Co., Buffalo, N. Y. Mr. Joyce's resignation becomes effective Oct. 1, 1915.

Hartdorn Grossman Factory Rep.

NEW YORK CITY, Sept. 28—L. G. Hartdorn, until recently production manager of the Emil Grossman Mfg. Co., Inc., Brooklyn, N. Y., has been appointed factory representative to cover the manufacturers in the territory west of Buffalo.

Fail to Settle Time for New Cars

N. A. C. C. Committee To Meet in New York Oct. 6—Definite Action Expected

DETROIT, MICH., Sept. 29—The committee of the National Automobile Chamber of Commerce, Inc., met here yesterday with the hope of evolving some solution of the troublesome question of announcing new models at all seasons of the year, and after considering all of the data on hand, was unable to make any definite announcement as to how the trouble could be remedied. An adjournment of the committee was made to meet in New York, Oct. 6, when some definite action will be taken. Those comprising the committee are: Hugh Chalmers, president Chalmers Motor Co.; John N. Willys, president Willys-Overland Co.; C. W. Nash, president General Motors Co.; C. C. Hanch, treasurer Studebaker Corp.; Alvan Macauley, vice-president and general manager Packard Motor Car Co.; W. C. Leland, manager Cadillac Motor Car Co.

Kansas City Dealers Favor Announcing New Cars Jan. 1

KANSAS CITY, MO., Sept. 24—The Kansas City Motor Car Dealers' Association has put itself on record as favorable to an announcement of their new models for the forthcoming year on Jan. 1 by all automobile manufacturers. A resolution to that effect was adopted by the association at its most recent meeting without opposition. The meeting was that for the election of officers and there was a very large attendance. The consensus of views was that the present plan of making these announcements at uncertain and irregular dates causes confusion and the change proposed is in line with the sentiment of automobile dealers throughout this part of the country.

The association fixed the date of the next automobile show for Feb. 7, 1916, and set in motion the arrangements to make the exhibition the greatest ever given here. Record sales are expected during the coming winter.

Officers Elected

Nelson W. Riley was chosen president of the association, William Brace vice-president and the following were made directors: W. E. Mallory, George A. Bond, Estell Scott, Chas. A. Williams, H. G. Kirkland, A. F. Norton and Henry Bruening. Mr. E. E. Peake will, it is understood, continue as secretary-treasurer, but that election does not come until later.

Chandler Declares 25% Dividend

Board of Directors Favors Issue of 200% Stock Div- idend on Common

CLEVELAND, OHIO, Sept. 28—A 25 per cent quarterly cash dividend on the common stock payable to the stockholders Oct. 1 has been declared by the Chandler Motor Car Co., this city. The board of directors also voted in favor of a 200 per cent stock dividend on the common stock subject to ratification by the stockholders Nov. 2.

The common stock of the Chandler company is now \$225,000 and if the stockholders ratify the 200 per cent stock dividend this will be increased to \$675,000. The preferred stock of the company is \$200,000.

Imperial Four Now \$850

JACKSON, MICH., Sept. 23—Taking effect to-day, according to an announcement made by J. I. Handley, vice-president and general manager of the Mutual Motors Co., maker of the Marion and Imperial, the price of the Imperial four will be \$850. This is a cut from \$995, made effective July 1 this year and a reduction of \$235 since last season. The price of the Imperial six remains the same.

Edison Battery on Ward Special

NEW YORK CITY, Sept. 27—The Ward Motor Vehicle Co., New York City, will offer its Ward Special, a 750-lb. delivery wagon, for \$875 on easy monthly payments, with one year's rental of the Edison battery included. This offer will be open until Oct. 31. The plan is to be tried in Greater New York and New Jersey and may be extended to other cities in the future.

Indiana Service Men Meet

INDIANAPOLIS, IND., Sept. 29—The first of three annual meetings of the Indiana Automobile Service Managers' Association, will be held at Hotel Severin in this city, 3 p. m., Saturday, Oct. 29. The meeting will be of the get-together type, with an address by President H. W. Drew, followed by talks by other members on the recent service managers' convention in Detroit.

Couple-Gear Trucks for England

GRAND RAPIDS, MICH., Sept. 22—Negotiations are pending between the Couple-Gear Freight-Wheel Co. and representatives from the British army, concerning the building of eighty scout motor

trucks for Great Britain. These trucks are to be similar to several which the local manufacturer has furnished to the United States Government, and are to be used especially in searchlight and radio work. The trucks are 16 ft. long and 6 ft. wide and have a 60-hp. motor. It is said they will cost \$10,000 each.

Studebaker Has 76,000 Orders for 1916 Cars

DETROIT, MICH., Sept. 24—The Studebaker Corp. has over 70,000 domestic orders scheduled for 1916 cars, and more than 6000 orders for shipment to foreign countries, including Canada, Great Britain, Australia, India, China, Philippines, South Africa, South America, Cuba, Porto Rico, Central America and continental Europe. The plants are working to full capacity.

De Lorenzi Sails for London

NEW YORK CITY, Sept. 27—Ernest A. DeLorenzi, export manager of the Maxwell Motor Co., sailed on the Orduna Saturday for his headquarters in London. Mr. DeLorenzi reported that Spain and Portugal are the biggest buyers of motor cars on the continent at the present time. There are scarcely any sales to Norway, Sweden, Holland and Denmark because of the tire embargo situation.

Regal Winter Tops Ready

DETROIT, MICH., Sept. 29—The Regal company has now its series of detachable Sedan tops for winter use for all three of its 1916 models. The new top takes the place of the standard one-man type which can be quickly replaced for summer use. The detachable Sedan type is finished in accordance with the remainder of the body, is electrically lighted, and has large glass windows.

New Studebaker Convertible Top

DETROIT, MICH., Sept. 27—The Studebaker Corp. is now offering a new convertible Sedan top at \$150. The top is easily applied to both four and six-cylinder touring models, and weighs but 75 lb. more than the touring car top. The glass of the windows and panels is removable, and when in place, the top is wind, water and weatherproof.

Lozier Moves to Cleveland

CLEVELAND, OHIO, Sept. 25—Harry A. Lozier, who announced last June the H. A. L. twelve, selling at \$1,750 either as a two-passenger roadster or seven-passenger touring car, has moved from Detroit to Cleveland. A description of the car appeared in THE AUTOMOBILE for July 1.

Trade Review of the Past Week

Detroit Factories Still Rushed— Dealers Report Good Sales Conditions in All Sections

DETROIT, MICH., Sept. 28—The demand for cars continues unabated, and with favorable conditions, dealers are quite outspoken in their belief that the year will close as a record one for them, so far as this territory is concerned, at least.

The increasing of the price of the Packard cars has not surprised the selling field here to any great extent, for they believe it quite logical under present materials market conditions, and as a matter of fact, they believe that more such advances would not be out of reason. The price increasing of this kind is not regarded as any hindrance to the sale of a car of the Packard type, and there is a general commendatory note regarding it.

Factories Behind Orders

At the Cadillac plant they are now building ninety cars a day, and all departments are working to that schedule. Ford continues to feel a strong demand, and is the usual number of orders behind. The present manufacturing schedule is about the same as it has been for some time—2000 cars total being made in the plant here and branches throughout the country. The factory production is about 500 completed cars now. September sales of Maxwells are said to be far beyond August, which were double the sales of the same month a year ago.

The financial statements of the concerns which have made them public have come in for a great deal of favorable comment among the trade. The feeling is quite general that management of all the concerns has been of the best, and that in spite of some damaging conditions early in the past fiscal year, the makers have so far as possible anticipated the prosperity now being experienced, and have been commendably alert in the matter of conserving every penny in order to give the people better cars for the money, and making money for themselves at the same time.

Good Conditions Everywhere

District representatives calling on the trade in all parts of the country report almost uniformly good automobile conditions everywhere, and the same optimistic view is held by dealers visiting here. They say, however, that in some sections other lines of business do not seem to be feeling the same degree of prosperity. The business man is rapidly awaking to the necessity of the automobile in his business.

Detailed Export Statistics Show That U. S. Dominates Automobile World

United Kingdom Continues Best Buyer, Taking 2619 Cars
Worth \$3,836,296 in July—France Imports 615 Worth
\$1,260,693—Big Gains in Exports to S. A. and Asia

WASHINGTON, D. C., Sept. 28—America's supremacy in the automobile world is shown in the latest export figures, published this week exclusively in THE AUTOMOBILE. These figures are in addition to the gross figures published exclusively in a recent edition.

When exports of commercial cars jump from fifty, valued at \$106,400 in July, 1914, to 2469, valued at \$6,803,001, in July last, and exports of passenger cars leap from 1265, valued at \$1,143,419, to 4118, valued at \$3,835,347, during the same periods, there can be no question about the United States dominating the automobile world. To this must be added the exports of parts, which jumped from

\$420,975 to \$1,663,997 during these periods.

United Kingdom Largest Buyer

In value of imports from this country the United Kingdom continues to hold first place. The imports of cars from this country into King George's domain increased from 227 cars, valued at \$183,988, in July, 1914, to 2619 cars, valued at \$3,836,296, in July last. During the seven months ended July these imports from this country increased from 4967 cars, valued at \$4,087,763, in 1914, to 14,494 cars, valued at \$21,998,112, in 1915.

Sixteen cars, valued at \$15,803, were

shipped to France in July, 1914, while in July last the number had increased to 615 cars, valued at \$1,260,693. During the seven months' period these exports increased from 1044 cars, valued at \$625,636, in 1914, to 4268 cars, valued at \$10,547,826, in 1915.

Italy's imports of cars from this country are not as large as formerly. In July, a year ago, there were sixteen cars, valued at \$8,640, shipped to that country, and in July last there were also sixteen cars shipped, but the value had dropped to \$6,340. The seven months' period shows that the exports to Italy dropped from 228 cars, valued at \$147,388, in 1914, to 108 cars, valued at \$63,295, in 1915.

While Germany imported sixteen cars, valued at \$17,364, from the United States in July, 1914, that country failed to receive a single car from this country last month, while the seven months' imports dwindled from 1063 cars, valued at \$799,552, in 1914, to four cars, valued at \$2,800, in 1915.

Under the heading "Other Europe,"

Exports and Imports of Automobiles and Parts for July and Seven Preceding Months

EXPORTS									
Automobiles									
	July 1914		July 1915		Seven months ending July 1914		Seven months ending July 1915		
	Number	Value	Number	Value	Number	Value	Number	Value	
Commercial	50	\$106,400	2,469	\$6,803,001	443	\$648,241	13,428	\$37,499,768	
Passenger	1,265	1,143,419	4,118	3,835,347	18,499	16,170,181	22,897	20,454,354	
Total	1,315	\$1,249,819	6,587	\$10,638,348	18,942	\$16,818,422	36,325	\$57,954,122	

EXPORTS BY COUNTRIES									
Automobiles									
France	16	\$15,803	615	\$1,260,693	1,044	\$625,636	4,268	\$10,547,826	
Germany	16	17,364	.....	.....	1,063	799,552	4	2,800	
Italy	16	8,640	16	6,340	228	147,388	108	63,295	
United Kingdom	227	183,988	2,619	3,836,296	4,967	4,087,763	14,494	21,998,112	
Other Europe	152	130,227	1,144	4,033,680	2,366	1,876,114	4,822	13,089,008	
Canada	257	386,234	643	428,348	3,356	4,069,621	3,961	3,192,526	
Mexico	2	1,647	19	22,001	54	65,974	61	56,306	
West Indies and Bermuda.....	40	35,033	377	197,292	320	286,063	1,704	916,448	
South America	90	62,288	315	157,964	872	709,239	1,212	643,718	
British Oceania	311	237,780	382	335,698	2,587	2,233,471	2,369	2,046,047	
Asia and other Oceania	115	121,896	252	189,227	1,179	1,110,001	2,178	4,309,410	
Other countries	73	48,919	205	170,809	906	807,600	1,144	1,088,626	
Parts of (not including engines and tires).....	.....	420,975	.....	\$1,663,997	.....	\$3,911,018	.....	\$7,343,119	
Total automobiles, etc.....	.....	\$1,670,794	.....	\$12,302,345	.....	\$20,729,440	.....	\$65,297,241	

Tires									
Belgium .....	.....	.....	.....	.....	.....	\$301	.....	.....
Germany .....	.....	\$6,090	.....	.....	.....	81,917	.....	.....
England .....	.....	156,961	.....	\$548,729	.....	889,793	.....	2,477,883	
Canada .....	.....	99,514	.....	66,409	.....	649,764	.....	522,234	
Mexico .....	.....	4,218	.....	8,027	.....	32,140	.....	65,451	
Cuba .....	.....	.....	.....	41,788	.....	.....	.....	165,627	
Australia .....	.....	.....	.....	34,089	.....	.....	.....	220,631	
Philippine Islands .....	.....	10,953	.....	22,107	.....	67,106	.....	172,857	
Other countries .....	.....	63,881	.....	168,205	.....	381,071	.....	673,300	

IMPORTS									
Automobiles									
Cars, carriages, other vehicles, and parts of:									
Automobiles, and parts of—Automobiles..No. dut.	13	\$26,168	16	\$35,365	104	\$178,631	133	\$219,826	

IMPORTS BY COUNTRIES									
Automobiles									
France	4	\$8,543	6	\$17,218	46	\$88,709	39	\$78,720	
Germany	3	6,755	.....	.....	9	15,128	.....	.....
Italy	1	1,000	.....	.....	18	22,798	22	28,526	
United Kingdom	3	4,072	1	1,947	13	28,979	25	53,206	
Other countries	2	5,798	9	16,200	18	23,017	47	59,374	
Parts of (except tires) .....	.....	\$104,338	.....	\$8,494	.....	\$602,829	.....	\$387,797	

which embraces all European countries not mentioned above, big gains are shown. In July a year ago 152 cars, valued at \$130,227, were sent to these countries, while in July last the number had increased to 1144 cars and the value to \$4,033,680. During the seven months' period the exports to "Other Europe" increased from 2366 cars, valued at \$1,876,114, in 1914, to 4822 cars, valued at \$13,089,008, in 1915.

Canada's imports of cars from this country have taken a jump, increasing from 257, valued at \$386,234, in July, 1914, to 643, valued at \$428,348 in July last. However, during the seven months' period the exports amounted to 3356 cars, valued at \$4,069,621, in 1914, and to 3961 cars, valued at \$3,192,526.

Although Mexico is having war the figures show that exports of American cars have increased from two, valued at \$1,647, in July, 1914, to nineteen, valued at \$22,001, and from fifty-four, valued at \$65,974, during the seven months of 1914, to sixty-one, valued at \$56,306, during the same period of 1915.

The West Indies and Bermuda have taken a big jump in the imports of American cars, the figures showing that forty cars, valued at \$35,033, were imported there in July a year ago, increasing to 377, valued at \$197,292, in July last, while during the seven months' period the imports increased from 320 cars, valued at \$286,063, in 1914, to 1704 cars, valued at \$916,448, in 1915.

South American Gains

South American countries are taking more kindly to American cars, the figures showing that the exports to our Southern neighbors increased from ninety cars, valued at \$62,288, in July a year ago, to 315 cars, valued at \$157,964, in July last, while during the seven months' period the exports rose from 872 cars, valued at \$709,239, in 1914, to 1212 cars, the value of which, however, was only \$643,718, in 1915.

The exports of cars to British Oceania in July, 1914, were 311 cars, valued at \$237,780, increasing to 382 cars, valued at \$335,698, in July last, but during the seven months' period there was a drop from 2587 cars, valued at \$2,233,471, in 1914, to 2369 cars, valued at \$2,046,047, in 1915.

Asia Also Gains

Exports of cars to Asia and other Oceania are increasing. In July, a year ago, the number exported to those countries was 115 and the value, \$121,896, increasing to 252 cars, valued at \$189,227, in July last, while during the seven months' period the number exported increased from 1179, valued at \$1,110,001, in 1914, to 2178, valued at \$4,309,410, in 1915.

The detailed tabulation of exports and imports is given herewith.

Mexico to Canada Non-Stop Run

Chandler Six on 1789-Mile Trip Without Stopping Motor or Wheels

CHICAGO, ILL., Sept. 28—*Special Telegram*—With but two days' preparation a Chandler six stock touring car started last Sunday from Tia Juana on what is claimed to be the most strenuous automobile tour ever attempted. From Mexico to Canada, without stopping either the wheels or the motor, is the record for which C. H. Hunter of Los Angeles and four companions are trying.

Eat and Sleep in Car

The non-wheel non-motor stop Chandler passed through Sacramento at 4 o'clock with the speedometer registering 767 miles. The total distance for the trip is 1789 miles and it is claimed that unless the tires blow out or the men break down under the strain the run will be completed at an early hour Thursday morning.

The men are eating and sleeping in the machine as well as taking gasoline and oil on the run from the Chandler dealers along the route. A long funnel with an elbow is used to get at the gasoline tank. The run attracted such wide attention in southern California that the Universal Film Corp. sent a camera operator on the tour to tell the story of the great demonstration of the efficiency of the modern automobile in film for the Universal Weekly. This is the first time that a picture company has devoted a reel to an automobile demonstration without cost to the manufacturer.

The car passed through Marysville, 815 miles, by morning half way to the Canadian line on the first non-stop run across the United States.

Equipment Features

Equipment features of the car are: Goodyear cord tires, Gray & Davis electric system, both Klaxon and Sparton horns, Boyce Motometer, Stewart speedometer and vacuum fuel feed, Bosch spark plugs, Rayfield carbureter and Monogram oil.

Rules Gasoline Is a Domestic Necessity in Texas

AUSTIN, TEX., Sept. 27—According to a ruling of the state attorney general's department gasoline is a provision and a domestic necessity and as such it can be sold on Sunday mornings up to the hour of 9 o'clock. One of the State's blue laws permits the sale of certain foodstuffs, produce and milk before 9 o'clock in the morning on Sundays. While gasoline is not mentioned in the law the attorney

general holds that it comes within the exempted provisions. However, the enforcement of the so-called Sunday law as to gasoline and other articles and goods is confined to only a few towns of the State. In all the larger cities gasoline is sold all day long and it is also possible to buy most kinds of foodstuffs and nearly everything else except intoxicants on Sunday. The request for a ruling on the sale of gasoline question came from the county attorney of Hays county at San Marcos.

S. O. Raises Gasoline 1 Cent in St. Louis

ST. LOUIS, MO., Sept. 29—*Special Telegram*—For the second time in two weeks the Standard Oil Co. to-day followed the lead of the independent refiners by raising the price of Red Crown gasoline 1 cent per gal., the new price being 10.9 cents. Since Sept. 15, the independents have been selling their No. 3 gasoline at 9.9 cents from wagons and at 11 cents at filling stations. It is expected that the independents will soon announce another increase as they have declared their intention of bringing the price back to 17.5 cents where it was two years ago, before the Standard started its series of eight cuts of 1 cent per gal. each.

S. O. Meets Gasoline Price Increase

KANSAS CITY, Mo., Sept. 24—The Standard Oil Co. has met the increase in the price of gasoline established by the Independents. On Sept. 16 the Standard announced the 1-cent rise in the Kansas City market, and now both independents and Standard are getting 9.8 cents a gallon. In some cities of Missouri gasoline is selling at 14½ cents, after an increase of 2 cents a gallon coincident with the 1 cent rise by the Standard at Kansas City. In Springfield the E. M. Wilhoit Oil Co. is getting 11.6 cents for gasoline, while the Standard and others are getting 10.6 after the 1 cent rise.

Gasoline Up 1 Cent in Milwaukee

MILWAUKEE, WIS., Sept. 24—In common with other markets, gasoline prices in Milwaukee have been raised 1 cent. Both Standard and independents have announced the advance, attributing it to an increase of 1 cent in the price of crude. The advance is due largely to the falling off in the supply in the Cushing fields in Oklahoma. So-called low test gasoline is selling for 11½ cents at filling station; 65 deg. at 15 cents and other grades correspondingly higher. Prices, however, were lower in 1914.

Swedish Embargo on Rubber

STOCKHOLM, Sept. 25—The Swedish Government has placed an embargo on rubber and varnishes.

Increasing Output of High-Class Cars Feature of Indiana Progress

Factories Rushed to Keep Up with Orders—Accessory and Parts Makers Also Busy—Friendly Rivalry of Engineers Brings Out Best of Designs

INDIANAPOLIS, IND., Sept. 27—Indianapolis is apt to be neglected somewhat by comparison with the greater center of Detroit, but if it were not for the concentrated industry of the latter city Indianapolis would certainly rank high among the automobile cities of the world.

For enterprise, take the most recent developments, and we find that Indianapolis is producing two twelve-cylinder cars, the National and the Pathfinder, to the one of Detroit. Take originality, and we can easily point to a half dozen firms in the Indianapolis section who design and build their own cars practically throughout. Take quantity, and it is easy to show that Indianapolis ranks high in output, more especially if we except such cities as Toledo whose output of automobiles is dependent mainly upon one large factory.

The Indiana Spirit

Without doubt Indiana in general and Indianapolis in particular has derived great benefit from the presence of the speedway. It is on this racing track that the automobiles of the Indiana manufacturers are tried and proved, and it is here of all places on the surface of the earth that automobile engineers have gathered together in friendly rivalry with experimental machines.

Last week, just before the reading of J. G. Vincent's paper on the twelve cylinder motor, almost any day would have found a gathering of Indiana's automobile engineers at the 2½-mile oval. On Sept. 24, for example, W. G. Wall (National); J. G. Vincent (Packard); Howard Marmon (Marmon); George Weidely; A. E. Winckler (Case); F. H. Nutt (Haynes), and several other engineers took turns to drive each other's 1917 experimental models.

Indianapolis Prosperity

With them were a score of others all more or less vitally interested in the engineering side of automobilism, each gaining knowledge and experience by the courtesy and freedom of the others; each helping to advance the automobile by free interchange of opinion with the others. Perhaps this ought to be called the speedway spirit, rather than the spirit of Indianapolis, but however this may be it is to the credit of Indianapolis that it is the first city of the globe to see such gatherings a common sight.

Like Detroit, Indianapolis is experiencing a year of prosperity, the like of which has never before been seen. Of its big factories, the National is building additions that will almost double its size and capacity—partly owing to the twelve, but more on account of general excellence of trade. The Pathfinder Co., lately reorganized, have orders on their books which encourage all production records to be broken. The Cole Co. have had a wonderfully prosperous season with their eight and look forward to a continued demand which will tax the resources of the engine makers for many months to come, while the Empire Co. are busy too, and the Nordyke & Marmon Co. are making the new Marmon 41 as fast as the factory can handle the material.

Outside Indianapolis, but in the same district, the Haynes Co. of Kokomo are so busy that their final inspection is being conducted in large tents, pending the completion of new buildings, which will enable the output to be raised to between 30 and 40 cars per day. In the same city the old Apperson Co., who also make practically every part of the car that bears their name, are turning out an exceptional quantity, and the same is true of every manufacturer in Indiana.

Nor is it only the complete automobile manufacturers that are busy, for it must not be forgotten that Indianapolis and the district surrounding can boast several important parts makers.

For instance Wheeler & Schebler are making an ever-increasing number of their carbureters, and their output now totals at the rate of over 350,000 per annum, nearly half a million. At Kokomo another well-known carbureter, the Kingston, is being made at a rate of well over 1000 per day, together with coils and magnetos which also are products of the Bryne Kingston Co.

At Marion, a stone's throw from Kokomo, is the Rutenber factory, which is rushed to the limit, despite recent new buildings and additions, since the Rutenber light six of 3 by 5 in. has proved one of the hits of 1916 with the automobile manufacturers.

South Bend, Anderson and other surrounding towns of automobile importance are likewise busy to the limit of capacity, and a bit over, so Indiana is without doubt taking its full share of the great wave of prosperity which is being enjoyed by the automobile industry of America.

Probably in thinking of Indianapolis few people would fail to remember first of all the Prest-O-Lite Co., but no doubt many would also reflect that the coming of electricity must have injured the automobile end of this great business. How little it really has been affected may perhaps be gaged by the following figures.

Taking the Prest-O-Lite gas tank service as it bears upon the automobile only, and neglecting the gas used for welding, for house lighting and for other purposes, the bill that the Prest-O-Lite Co. has to foot for the transportation of empty and full gas tanks still stands at the astounding figure of \$675,000 per year. In the last twelve months over 20,000 car loads of automobile size tanks alone were handled, and it is computed that the number in use exceeds 1,400,000 tanks. A rough average tonnage of freight per annum on empty and full tanks handled by the main factory and its twenty-one charging branches reaches the amazing total of 700,000,000 lb.

Blood Bros. Discontinue Cornelian

DETROIT, MICH., Sept. 29—The Blood Bros. Machine Co., Allegan, Mich., which has been making the Cornelian cars in addition to its universal joints has decided to discontinue the manufacturing of automobiles of which about 100 were made. Hereafter the factory will be devoted exclusively to the manufacturing of the Blood universal plants of which 3000 to 3500 are now made per month. Over 100 men are employed and the concern states that it has already enough business to occupy its attention for three months with orders from truck makers. Negotiations are under way to sell the car business to Allegan interests.

Packard's New Prices—Why They Are Higher

DETROIT, MICH., Sept. 25.—As reported briefly in last week's issue of THE AUTOMOBILE, the Packard Motor Car Co. has increased the selling price of its Twin Sixes of both models, the raise being from \$150 to \$200, according to the model or the body style. The new prices for all Packard cars are given herewith.

In a letter to all its dealers the Packard company made some interesting statements as to the reason for increasing the prices. Part of the letter reads as follows:

"The cost of aluminum has advanced \$50 per car, consisting of approximately 300 lb. of castings, which have increased 12 cents per pound; 110 lb. of sheet aluminum, which has advanced 11 cents per pound, and aluminum molding, which has increased \$1.50 per car. Brass and copper have advanced approximately 4 cents per pound. There are approximately 250 lb. of brass castings

on each car, and these represent an increased cost of \$10. The materials for our radiators have advanced \$2.50 to each radiator. Lamps have gone up \$2 per set. Crankshaft and connecting-rod bearings have advanced \$2.50 per car. The advance on door handles alone represents 50 cents to each car.

"High-grade steels show a terrific increase, and the advance from this source is approximately \$13 per car. We have to pay \$2 more per motor for tungsten steel valves, and ball-bearings represent an increase of \$3.50 per car. Frames represent an advance of \$4.50, and the trimming leather alone costs \$17.50 more for each car.

"Together with many less important items the total increase in actual cost of materials is between \$150 and \$200 per car, with no prospect of relief."

An out-of-town Packard dealer in speaking about the new prices said that if the war in Europe will last another six months the probabilities are that not one automobile manufacturer will be able to reduce his prices next year. In fact, the example of the Packard and Cadillac companies will most likely be followed by other concerns, as it is getting more and more difficult to get materials, even at higher prices.

Perfection Tire Appears

FORT MADISON, IOWA, Sept. 23—A new tire, guaranteed to be heat-and-water proof and to give satisfactory service for 7000 miles without punctures or blowouts, will shortly be placed on the market by the Perfection Tire & Rubber Co., Fort Madison, which is now erecting two plants. The first unit will be entirely completed, with machinery installed, by Oct. 15. The second will be ready for occupancy not later than Dec. 1.

The initial output will be 1000 tires a day, commencing Dec. 1. These tires will be manufactured under the Evans patent, which combines the use of asbestos and rubber.

The Perfection Tire Sales Co., which will have its main office in Buffalo, N. Y., will take care of the sales end of the business. J. N. Sochrest will head this department.

Troubles with Trucks at the Front

Efficiency Improved—Ignition, Cooling and Brakes Some Weak Points

LONDON, ENGLAND, Sept. 10—In a recent visit made by an American truck representative with a military transport to the front in Flanders, an opportunity was afforded of observing the work of motor trucks in the war zone. Since the opening of the war many changes have been made which have increased the efficiency of the trucks. Chief in this regard is putting men who have had most experience on certain makes of trucks and keeping them driving these makes. It has also been found profitable to keep trucks of the same make as close together as possible in the same convoy and increasing the size of the convoys to do this. It has been found advisable to have a reserve wagon accompany convoys, this wagon equipped with the necessary spare parts, and skilled mechanics for the particular make of truck used in the convoy.

A frequent trouble with many English makes of trucks using force feed lubrication is that they have the pump in the bottom of the crankcase sump with outside oil pipes delivering the oil from the main bearing to the crankshaft. These external pumps are rapidly broken by vibration, which is immediately followed by loss of oil and in nearly every case burned out bearings follow.

Ignition Not Waterproof

Not sufficient protection is given the ignition system to make it waterproof in several makes of trucks. Bad weather conditions have made many of the roads near the front veritable water bogs, the water splashing through the radiator and then carried by the fan through the ignition terminals.

On many English makes the road clearance is not sufficient, with the result that the tie rod of the steering gear frequently strikes the ground, throwing the wheels out of line. There are other makes which, because of the small clear-

ance, really bury themselves in the mud and some with large rear axles which catch the mud have not power enough to drag themselves out.

Some trucks are very much behind in the matter of lubricating the wheels, which in some cases is done by a large grease cup threaded into the outside of the hub. The same is true with universal joints. It is the exception rather than the rule to see grease cups remain in; they all loosen, due to centrifugal force.

Cooling Most Important

Trucks without water pumps are generally boiling all of the time. In fact, cooling is one of the most serious matters with many trucks. This is aggravated by the lack of attention given trucks by many drivers, and also by road conditions.

Another serious fault is that clutches are not sufficiently fool-proof and quite frequently have not a large enough factor of safety to take care of the overloading and poor driving the vehicles are subjected to. In almost ninety-nine out of 100 trucks observed the drivers had their heavy military boot resting equally heavily on the clutch pedals, which meant early trouble.

It seems as though the majority of designers have tried to show how heavy they could make the fan and how light or cheaply they could buy the belt. This, coupled with a very inefficient inaccessible belt adjustment, does not help the cooling situation. Many makers are only beginning to realize that they must have better protection in front of the radiators.

So often each particular maker has his own idea to what particular height the body should be from the ground with the result that scarcely any two trucks can back up to the same load platform and unload or load heavy crates. In addition, in the same make of trucks there will often be half a dozen different designs of tailboards, and as these invariably get broken, there is needless trouble in replacing them.

Brake Adjustments Poor

Brake adjustments are very poor, being so frequently in inaccessible places or requiring some special kind of tool, which is invariably lost to make the adjustment.

There is a great scarcity of rubber tires. Scarcely a week ago 150 American trucks of one make were still being held in the crates at a French port waiting for tires.

The situation in England with reference to America is quite unusual. The sentiment against American trucks is strong, but it is a dog-in-the-manger attitude because all of the British makers are booked up with the War Department for 6 or 8 months, and as trucks are needed they must come from America.

New Prices on the Various Models of Packard Cars

	Model	I-25	Model	I-35
	New Price	Old Price	New Price	Old Price
Chassis only.....	\$2,350	\$2,200	\$2,650	\$2,450
Seven-passenger touring car.....	2,750	2,600	3,150	2,950
Seven-passenger salon touring car.....	2,750	2,600	3,150	2,950
Six-passenger touring car.....	.....	.....	3,150	2,950
Five-passenger phaeton.....	2,750	2,600	3,150	2,950
Five-passenger salon phaeton.....	2,750	2,600	3,150	2,950
Two-passenger runabout.....	2,750	2,600	.....	.....
Three-passenger coupe.....	3,700	3,550	.....	.....
Six-passenger limousine without cab sides.....	4,150	4,000	4,550	4,350
Six-passenger landaulet without cab sides.....	4,150	4,000	4,550	4,350
Four-passenger brougham.....	4,200	4,050	4,600	4,400
Seven-passenger Imperial limousine.....	.....	.....	4,800	4,600
Seven-passenger salon limousine.....	.....	.....	4,750	4,550
Seven-passenger limousine with cab sides.....	.....	.....	4,650	4,450
Seven-passenger limousine without cab sides.....	.....	.....	4,600	4,400
Seven-passenger landaulet with cab sides.....	.....	.....	4,650	4,450

two new directors were elected, J. A. Damon and C. A. Kellogg, while H. A. Sanford, W. A. Keen and N. J. Brown of the old board were re-elected. The capital stock of the company has been increased to \$15,000 and an effort will be made to add at least an equal amount within the next few weeks. The business outlook is reported by officers of the company to be most promising.

Toledo-Ford Tire Elects Directors

TOLEDO, OHIO., Sept. 25—The first annual meeting of the stockholders of the Toledo-Ford Tire Co., was held recently in this city. The following directors were re-elected: R. F. Teall, R. O. Wire, William Dunbar, C. E. Taggart, A. O. Hamilton. The two new members of the board are G. N. Graham and Henry Hard. The company is producing about 400 tires a day or around 12,000 a year.

Duplex Power Car Elects

CHARLOTTE, MICH., Sept. 22—At the annual meeting of the board of directors of the Duplex Power Car Co. the old officers were re-elected. The officers are, Frank P. Town, president; Frank E. King, vice-president; Horton H. Bryan, treasurer and M. J. Lamson, secretary.

Republic Truck's Second Increase to \$500,000

ALMA, MICH., Sept. 4—For the second time this year the stockholders of the Republic Motor Truck Co. have voted to increase the capital stock of the company. The first time this increase was from \$50,000 to \$250,000. Now they have decided to increase it to \$500,000.

Securities Markets Strong

Many Substantial Gains in Various Issues—Trading Conditions Normal

NEW YORK CITY, Sept. 28—Stocks were active and generally strong last week, with pronounced advances in a number of issues. The recent distribution of a 50 per cent cash dividend by General Motors acted as a renewed stimulant for the so-called war stocks. With the many gains that took place General Motors once again was the feature of the markets. There was a strong tone at the opening with a continued rise in all issues except two, these declining but a few points. The closing bid of General Motors was 540, a gain of 58 points. Another noted rise among the specialties was Overland with a gain of 21 points. Maxwell served to stimulate an advancing movement in the company's shares, and all three issues rose to substantial gains. There was a total volume of 61 per cent sales increased over 1914. The rest of the specialty stocks made but a few points gain.

Tire Markets Boom

The tire issues last week all recorded net advances ranging from one-half to 27 points. A 20-point rise in the Good-year common on top of a 10-point advance was taken as convincing evidence that the company proposes a large stock distribution. Kelly-Springfield featured the tire market with a 27-point rise. With the betterment in tire sales it is

likely that the U. S. Rubber Co. will earn a balance above preferred dividends equal to more than 8 per cent on the \$36,000,000 common. Many other small gains took place in the tire issues, such as Firestone with a gain of 15 points and Goodrich with 3½ points. The rest made but minor gains.

Detroit Conditions Normal

Although the Detroit issues recorded many good gains the trading conditions were normal. General Motors featured the market there also with a gain of 55 points. Maxwell's closing price was 53, which was 9 points above last week's rating. Studebaker common made a very good rise on Friday, rising 17 points and on Saturday dropped but 2 points. The rest of the stocks made a few small changes.

White Co. Increases Capital to \$8,000,000

CLEVELAND, OHIO, Sept. 24—Following a reduction in capital stock on Sept. 22 from \$3,000,000 to \$2,500,000, the White Co., this city, has filed an application for an increase to \$8,000,000.

These changes are in line with the recent announcement by which notice was given of the calling of \$500,000 preferred and the issue of an enlarged preferred stock which will be distributed among members of the White organization who desire to retain their investment, but to drop out of the active management. Holders of the old preferred were also given rights to the new preferred. The public interest is limited to \$500,000 of preferred, all of the remaining stock being held by the White family.

Automobile Securities Quotations on the New York and Detroit Exchanges

	1914		1915		Wk's
	Bid	Asked	Bid	Asked	Ch'ge
Ajax-Grieb Rubber Co. com.			300		..
Ajax-Grieb Rubber Co. pfd.			101	110	..
Aluminum Castings pfd.			102		..
J. I. Case pfd.			79	84	+1
Chalmers Motor Co. com.			116	120	+7
Chalmers Motor Co. pfd.			96	101	..
Electric Storage Battery Co.			77	78½	+4
Firestone Tire & Rubber Co. com.			540		+15
Firestone Tire & Rubber Co. pfd.			111		..
General Motors Co. com.			344	345½	+58
General Motors Co. pfd.			113	115	+1
B. F. Goodrich Co. com.			69	71	+3½
B. F. Goodrich Co. pfd.			108	109	..
Goodyear Tire & Rubber Co. com.			310		+15
Goodyear Tire & Rubber Co. pfd.			109		+½
Gray & Davis, Inc., pfd.		
International Motor Co. com.			29	31	..
International Motor Co. pfd.			58	63	-3
Kelly-Springfield Tire Co. com.			230	235	+20
Kelly-Springfield Tire Co. 1st pfd.			90	92	+2
Kelly-Springfield Tire Co. 2d pfd.			235	240	+27
Page-Detroit Motor Car Co.			..	450	..
Maxwell Motor Co. com.			52	53½	+6½
Maxwell Motor Co. 1st pfd.			92	94	+3
Maxwell Motor Co. 2d pfd.			44	46	+7
Miller Rubber Co. com.			190	195	..
Miller Rubber Co. pfd.			107	109	..
New Departure Mfg. Co. com.		
New Departure Mfg. Co. pfd.		
Packard Motor Car Co. com.			120		..
Packard Motor Car Co. pfd.			100		..
Peerless Motor Car Co. com.			130		+10
Peerless Motor Car Co. pfd.			92	94	-1
Regal Motor Co. pfd.			..	21	..
Portage Rubber Co. com.			55	58½	..
Portage Rubber Co. pfd.			93	94	..
*Reo Motor Truck Co.			16½	17½	..

No quotations available at this time on account of war.

	1914		1915		Wk's
	Bid	Asked	Bid	Asked	Ch'ge
*Reo Motor Car Co.			32¾		+¾
Splittorf Electric Co. pfd.		
Stewart-Warner Speed. Corp. com.			74	76	+6½
Stewart-Warner Speed. Corp. pfd.			106		+1
Studebaker Corporation com.			139	140	+10½
Studebaker Corporation pfd.			107	108½	+1
Swinehart Tire & Rubber Co.			86	90	..
Texas Company			163	165	+10
U. S. Rubber Co. com.			52	53½	+¾
U. S. Rubber Co. pfd.			106	107½	+2
Vacuum Oil Co.			223	228	+5
White Co. pfd.			110		..
Willys-Overland Co. com.			213	214½	+21
Willys-Overland Co. pfd.			107	109	+1½

OFFICIAL QUOTATIONS OF THE DETROIT STOCK EXCHANGE

ACTIVE STOCKS					
Chalmers Motor Co. com.	97		121		..
Chalmers Motor Co. pfd.	..	97½	102½		+¾
Continental Motor Co. com.	155	180	280		..
Continental Motor Co. pfd.	..	75	85	90	..
General Motors Co. com.	60		340	350	+55
General Motors Co. pfd.	80½		112½	115	+1½
Maxwell Motor Co. com.	10½		53	59	+9
Maxwell Motor Co. 1st pfd.	28		91½	94½	+3½
Maxwell Motor Co. 2d pfd.	..		45	47	+9
Packard Motor Car Co. com.	..		123	130	+3
Packard Motor Car Co. pfd.	90	94	100		..
*Paige-Detroit Motor Car Co.	..		..	450	..
*Reo Motor Car Co.	..	20	32¾	34¾	-¾
*Reo Motor Truck Co.	10	10¾	16¾	17¾	-¾
Studebaker Corporation com.	..		137	142	+17
Studebaker Corporation pfd.	..		106	110	+1
INACTIVE STOCKS					
*Atlas Drop Forge Co.	21			31	..
Ford Motor Co. of Canada	..	500	1500		..
Kelsey Wheel Co.	..		205		..
*W. K. Prudden Co.	..	20½	20½	22	..
Regal Motor Car Co. pfd.	25			21	..

*Ex dividend. Par value of these stocks \$10; all others \$100 par value.

Kissel to Double Production

Two Additions Started—Four-Story Office Building Also on Enlargement Schedule

HARTFORD, WIS., Sept. 24—Ground was broken last week for the first of an important series of building operations at the plant of the Kissel Motor Car Co., this city. The company is preparing to double its production in the near future.

Two new buildings are started, one for storage and shipping, and one for the enameling department. The former is to be 100 ft. long and the other 110 ft. long, each being 35 ft. wide. The third structure, soon to be started, is a four-story office building, which will house all of the executive and clerical forces of the company, including the cost and drafting departments. A production of thirty to thirty-five passenger cars per day will be possible.

Splitdorf Electric Buys \$1,000,000 Plant

NEWARK, N. J., Sept. 24—The purchase for \$1,000,000 of the Sumter Electrical Co., Sumter, S. C., by the Splitdorf Electrical Co., this city, has been closed. This new plant will be used to produce magnetos of every type, including low-tension types for use on stationary, marine, and tractor engines. The company is building nearly 1500 Dixie magnetos a day.

To Subscribe \$250,000 for Flint Workmen's Homes

FLINT, MICH., Sept. 21—At the weekly meeting of the Board of Commerce held to-day, announcement was made that within a few hours after the general campaign for workingmen's homes was started this morning, \$31,000 had been subscribed. Last week \$65,000 was subscribed and it now looks as if the \$250,000 which is needed will be forthcoming ere long. C. S. Mott, president of the Weston-Mott Co., is general chairman of the work and trustee for the fund. It is intended to have 1000 houses built as soon as possible. At the present time there is such a shortage of homes that in many houses twice the number of people are housed than normally.

Page Makes Trailers

MARSHALL, MICH., Sept. 18—The Page Bros. Buggy Co., an old established concern which has been making buggies and carriages for many years, is now also making trailers which will be known as the Page Auto Trailers.

The trailers are made in four models.

Models A and B have 750 lb. capacity, but while the former has 1½ by 5/16 in. round edge steel tires and costs \$40, the other model is equipped with 1½ in. solid tires, the price of this model being \$50. Both have the same kind of body, 38 by 82 in., with 7 in. sideboards and 4½ in. flareboards. Sheldon axles and springs are used. Both models C and D are listed at \$75 and have 1250 lb. capacity, 1½ in. solid rubber tires, artillery wheels. The former model has 7 in. straight sides but model D has 11 in. straight sides.

Dry Climate Tire Plant Starts Active Manufacture

DENVER, COL., Sept. 22—The Dry Climate Tire Mfg. Co., a new \$200,000 Colorado corporation, started its Arvada factory yesterday. A force of twenty-five men is preparing compounds and fabric, and the concern expects to be turning out tires for the trade next week. A few special tires will be built the last of this week for exhibition at the Automobile Trades Association's fall show starting next Sunday in connection with the International Soil Products Exposition.

The company expects to have two or three shifts of fifty men each at work within a few weeks. With this force and the present equipment, the plant will have a capacity of 100 casings and 350 tubes every eight hours. The building making the first unit of the factory cost \$28,000 and the machinery, which is the most modern obtainable, cost \$35,000. Plans are under way for additional buildings, and enough extra equipment has already been ordered to increase the capacity of the plant more than 50 per cent. The factory manager is W. J. Kreuder.

The new concern aims to reach about ten states in the Rocky Mountain territory, and has a special process of curing and compounding designed to increase the life of tires in this dry region.

The factory is located 7 miles from Denver, with good shipping facilities.

Dividends Declared

Paige-Detroit Motor Car Co., Detroit, Mich., 5 per cent for September, payable Oct. 10 to stockholders of record Sept. 30.

Republic Rubber Co., Akron, Ohio: Quarterly, 1¼ per cent on common and preferred, payable Oct. 1.

35 Per Cent Dividend to Walpole Creditors

BOSTON, MASS., Sept. 27—Judge Dodge in the U. S. district court has allowed a seventh dividend amounting to 35 per cent to all creditors of the Walpole Tire & Rubber Co. This brings the total dividends to 85 per cent.

Motor Truck Too Much for R. R.

Kentucky Commission Exonerates C. F. & S. from Long and Short-Haul Rule

LOUISVILLE, KY., Sept. 24—The Kentucky State Railroad Commission recently entered an order exonerating from the operation of the long and short-haul rule, which forbids a lower freight rate from one given point to another than is charged to intermediate points, the Cincinnati, Flemingsburg & Southeastern into Flemingsburg. The order is subject to a reopening of the case upon ten days' notice after any complaint may be filed.

This is the first exoneration from the long and short-haul clause on account of conditions arising from competition between a railroad and an automobile. It was shown that by reason of the operation of a motor truck between Maysville and Flemingsburg revenues of the 5-mile railroad line, making but the one point, Flemingsburg, have been reduced more than 50 per cent, and this competition is a matter of life or death with it.

Pratt & Whitney Tool Makers Strike for Eight-Hour Day

HARTFORD, CONN., Sept. 27—The machinists and other employees of the Pratt & Whitney Co. at a meeting to-night voted to strike for the inauguration of an 8-hr. day with no reduction in pay in the plant. At present the plant is run on the open shop plan, 10 hr. a day, with a half holiday Saturday.

Last week twenty-five tool makers employed in the plant went on strike as a protest against the discharge of two other tool makers. The company employs about 3200 men.

Brown & Sharpe Foundrymen Strike

PROVIDENCE, R. I., Sept. 24—Two hundred men in the foundry of the Brown & Sharpe Co. joined the strike declared against the plant by the machinists several days ago.

Weldum Succeeds G.-A. Aluminum Co.

NEW YORK CITY, Sept. 24—Owing to difficulties created by the war, the Weldum Co., an American concern, has taken over the business of the German-American Aluminum Co., whose home offices are in Berlin. The Weldum Co., whose officers are practically the same as those who controlled the interests of the German-American concern in this country, is now manufacturing under the name Weldum the metal used for replacing welding in aluminum repair work by using practically a soldering process.

Weldum, which was described in THE

AUTOMOBILE for Sept. 17, 1914, under the name of German-American aluminum solder, is the invention of a German metallurgist and is in common use in that country by the German government. The manufacturers claim that no breaks are too complicated to be repaired by it. Its tensile strength is about double that of aluminum and due to its low melting point, 400 deg. Fahr., a common gasoline torch can be used. By careful work no machining is said to be necessary after the work is completed. It is a secret compound containing eight ingredients, five being metals and the other three salts of metals.

New Departure Adds

BRISTOL, CONN., Sept. 30—The New Departure Mfg. Co., this city, is erecting extensive additions to its 10-acre plant, and is installing machinery that will enable it to double its present production.

There is in process of construction in this city what will be one of the largest buildings specially designed and equipped for grinding purposes in the world. Another extension will be that of its heat-treating buildings. This building, when completed, will contain 230 oil-fired furnaces. Supplementary to the furnaces themselves, will be a new arrangement of the quenching vats and the operation of a liquefied ammonia gas refrigerating system, which will increase the amount of work per furnace, and hold the processing of the steel to practically perfect uniform quality. Other departments will be increased correspondingly, so that the present 23-hr. per day production capacity will be doubled.

Pontiac Gets Columbia Truck

PONTIAC, MICH., Sept. 25—The local board of commerce has succeeded in inducing the Columbia Motor Truck Co., Kalamazoo, Mich., to move to this city. A site of five acres will be furnished to the truck manufacturer, and the board of commerce is to take charge of the erection of a suitable plant. The Columbia company expects to build 300 trucks within the next twelve months, it is said.

Goodyear to Hire 1000

AKRON, OHIO, Sept. 23—The Goodyear Tire & Rubber Co., this city, has started a house-to-house canvass to find rooms for 1000 men that the company will bring here within the next two weeks. Four new buildings, an addition to the plant, will be put in operation as soon as the company can find men to work in them.

Knox Motors Grants 8-Hr. Day

SPRINGFIELD, MASS., Sept. 23—The Knox Motors Co., this city, employing 400 machinists, has granted an eight-hour working day, without loss of pay, to its employees, to go into effect Oct. 4.

Wins Pa. Speed Trap Appeal

Court Holds Trap Must Be Worked from Both Ends To Be Legal

CHESTER, PA., Sept. 25—For the first time since the passage of the automobile law of Pennsylvania in 1913 a judge of the State passed on the methods to be used by officers in enforcing the law. Daniel Griffith, was arrested for speeding at Marcus Hook and the magistrate before whom the case was first taken convicted him, whereupon an appeal was taken. Judge Johnson, before whom the case was taken, decided that in order to maintain a speed trap it would be necessary for officers to be at both ends of the trap with stop watches and to be in communication with each other. For a long time many officers in the county have been reaping a harvest by jumping out of bushes and arresting automobilists on the charge of speeding. Judge Johnson also decided that the decisions of all magistrates could be appealed and dismissed the charge brought against Mr. Griffith.

Enforcing Non-Glare Ordinance in K. C.

KANSAS CITY, MO., Sept. 27—Kansas City police are actively enforcing the ordinances prohibiting glaring lights on automobiles. Recently twenty-one cases were called one morning in police court against owners and drivers charged with violations. Fines imposed ranged from \$2 to \$5, although the judge hinted at the chance that some maximum fines of \$500 might be assessed against repetitions of the offense.

Non-Glare Ordinance in Minneapolis

MINNEAPOLIS, MINN., Sept. 24—With the adoption of a light dimming ordinance by the Minneapolis city council last Friday the Twin Cities are now on a common basis as to lights and frequent arrests are likely to be cut down. The ordinance forbids use of electric or other headlights that dazzle on automobiles. It also prescribes zones in which street car headlights must be dimmed.

Solve Delaware and Pennsylvania Tangle

WILMINGTON, DEL., Sept. 27—The tension between Delaware and Pennsylvania automobilists, because of an obnoxious feature of the Delaware law, taxing cars owned by outside corporations, firms and partnerships which come into the State, is such that a state of warfare has existed lately, in that traps have been set in Pennsylvania especially to catch Delaware cars when there was any violation of the Pennsylvania law.

It now looks as if Pennsylvania will take a reasonable view of the matter and will call off the traps, as the motorists are not responsible for the obnoxious feature of the law and have promised to endeavor to have the next Legislature repeal it. Meanwhile the local authorities are giving offending drivers an opportunity to take out a license.

100 Maxwell Dealers Talk Economy Contest at Plant

DETROIT, MICH., Sept. 27—Maxwell dealers from zone No. 1, which includes all the New England States, New Jersey, Maryland, eastern New York and eastern Pennsylvania, are here to the number of nearly 100. They came to visit the Maxwell Motor Co.'s plant and receive the final instructions for the cross-country economy run or contest which has been arranged for them and for which president Walter E. Flanders has donated three cash prizes.

This economy test started from Buffalo Tuesday. To-night the dealers and at least eighty Maxwell cars will make the trip per boat to the New York State city. Upon arrival there the run will be started, the cars being filled with lubricating oil and water here, the oil tank being sealed. The tank contains 1 gal. of lubricant, which is considered sufficient to enable every contestant to reach his destination. Several of the dealers will travel from 500 to 700 miles and may require three days to get home.

They will leave in two divisions, one traveling east and the other south, and as these divisions near their respective homes they will split. All contestants have received a special blank form of affidavit which they must fill out and mail to General Manager and President Flanders. It is expected that the winner will average 30 miles or better to the gallon.

Shadow-Boxes Test Headlights in St. Louis

ST. LOUIS, MO., Sept. 20—Shadow boxes to test the projection of headlight rays and enable the municipal adjusting bureau to adjust them to the degree required by a recent ordinance, are being tried out in St. Louis this week. Meanwhile the police have called a temporary halt of their war on headlights.

The shadow-box is in reality a darkened area-way 75 ft. in length and affording space for an automobile to drive in. Should the one now in use at the city hall prove a success, similar shadow-boxes will be installed at all police stations. The police plan to stamp every headlight which has been thus adjusted and approved and such a stamp will exempt the owner from arrest under the dimmer ordinance.

Ford Race at Mich. State Fair

Every Owner of Model T Is Eligible—Heats 5 Miles—Final 10—\$500 Prizes

DETROIT, MICH., Sept. 27—Every owner of a Ford Model T car in the State of Michigan is eligible for the race meet which will be held on the 1-mile dirt track of the Michigan State fair grounds, Sunday, Oct. 17, and which is being promoted by General Manager G. W. Dickinson.

It is to be the first race for a trophy to be known as the Michigan Ford Championship Cup, to be competed for twice a year. In addition to the trophy there will be prizes aggregating in value \$500.

The principal condition is that the car must be entered by the owner who, like the driver, must be a resident of Michigan.

It is expected that there will be so many entrants that several heats will be necessary. While no distance has as yet been decided upon it is said that the heats will very likely be run over a distance of 5 miles and the final over 10 miles.

The promoter is going to get the advice of the engineers of the Ford Motor Co. as to the distance most suitable or advisable.

No Race for Corona?

CORONA, CAL., Sept. 22—There is only a possibility of a 1915 Corona road race. Since the Nov. 20 date has been abandoned, opposition to the race has grown and it is now hardly probable that interest can be kept up until the highways into Corona are completed. It is known that the Contest Board will not sanction the race this year unless there is a 75-ft. safety zone between the outer edge of the course and the guard rail of the grandstand and with the stands placed back of the pepper trees which line the course, it is hardly probable that the race will be a financial success as it would be almost impossible for the spectators to see it.

Hyatt Roller Bearing Announces Winners in Talk Contest

DETROIT, MICH., Sept. 27—The Hyatt Roller Bearing Co. has made known the names of the winners in the contest which it recently promoted to determine the best talks on Hyatt bearings which salesmen are using to automobile prospects. The winners who are listed in an attractive booklet entitled, "The Six Best Sellers," are as follows: F. E. Cerf,

retail sales manager, Ralph Temple Automobile Co., Chicago; Henry Crowther, vice-president Crowther Motor Co., Philadelphia; Albert Hoyt, Chevrolet Motor Co. of Illinois, Chicago; J. E. Staley, Holsman-Stevens Automobile Co., Des Moines, Iowa; Curtiss M. Betts, Mitchell Automobile Co., Chicago; L. S. Vaughn, Oklahoma-Oakland Co., Oklahoma City. In addition prizes and special mention were awarded the following: A. R. Meyer, sales manager, Albaugh Motor Sales Co., Cleveland; G. A. Volbrey, Weber Implement & Automobile Co., St. Louis; Thomas A. Murphy, Ford Motor Co., Portland, Ore.; Edward Coyle, De Luxe Automobile Co., St. Louis; E. B. Valtzay, Warner Gear Co., Detroit; C. W. Ingrayn, Driggs-Seabury Ordnance Corp., Sharon, Pa.; J. A. Baird, General Motors Truck Co., Pontiac, Mich.; T. M. Leahy, Mitchell-Lewis Motor Co., Racine, Wis.

Indianapolis Race on Oct. 9 Abandoned

INDIANAPOLIS, IND., Sept. 27—The special invitation 100-mile race which was scheduled to be held on the speedway here, Oct. 9, and for which the American Automobile Association had granted a sanction, has been declared off. It is believed the cause for the abandonment of the contest was the objection of De Palma and Resta to competing against more than one car of the same make in this event. As a preliminary to the race, a 100-mile event for Ford cars had been planned, and though this has been abandoned as well, it may be revived.

Goodyear Extends S-V Truck Tire Test

NEW YORK CITY, Sept. 28—The Goodyear Tire & Rubber Co., Akron, Ohio, will extend its special S-V truck tire competitive free test offer for another six months. This will make the offer cover a year instead of the three months originally decided on. The new six months' period will end April 1, 1916. The offer is as follows: Equip opposite wheels—at the same time—one with a Goodyear S-V, one with any other standard make tire of like rated size bought in the open market. If the Goodyear S-V fails to cost less per mile than the other, the company will return its purchase price.

Forty-nine Makes at Cincinnati Show

CINCINNATI, OHIO, Sept. 27—Cincinnati's fall exposition given under the auspices of the Cincinnati Automobile Dealers' Association, will be opened at Music Hall, Oct. 2. To date forty dealers representing forty-nine makes of passenger cars and trucks, have applied for show space. Thirteen accessory houses have so far closed for space.

Topeka Dealer Show Is Success

Have Building of Their Own—Room for 14 Spaces for Exhibition of Cars

TOPEKA, KAN., Sept. 24—The automobile and supply men of Topeka probably got more good out of the State fair than any other group of exhibitors—and their exhibit had been swiftly arranged for, like the things that are done on the spur of the moment. They had a building of their own—and it made such a hit with the fair officials and the county officers, that it may be enlarged.

The automobile men of Kansas—particularly of Topeka—didn't want to take cars to the free State fair and exhibit them in a tent. E. B. Kellam, an old-time Topekan, who had been away for two or three years, got interested, and worked up a plan for the erection of a special automobile building. He and H. H. Southwick of the Southwick Auto Supply Co., and J. R. Cowdrey of the Cadillac Sales Co. got enough subscriptions to pay for a building—then got some more to make the building better.

On a space of 50 by 112 ft. a substantial concrete and brick bed was laid, rising about 3 ft. from the level of the ground, and reached by steps. Posts were set at intervals, and a roof guaranteed for fifteen years raised over this floor. Canvas curtains were installed for walls. The experience of State fair week this year, during which there was a lot of rain, was that canvas walls are adequate—there is no wood inside to be damaged by winter storms or during the summer when the canvas curtains are stored away. And they can be raised for clear sweep for breeze during fair days.

In this Motor Hall are fourteen spaces for exhibition of cars and equipment, each space is 16 by 18 ft. and capable of containing two cars. Each space was filled for the fair. There is a 12½ ft. aisle.

Electrical Show in Kansas City

KANSAS CITY, MO., Sept. 24—Albert T. Clark, manager for the Anderson Electric Car Co. here started something in the meeting of the Jovian Electric Club of Kansas City last week, and the result may be an electric show during Electrical Prosperity Week, Nov. 29 to Dec. 4.

To Survey for Los Angeles Speedway

LOS ANGELES, CAL., Sept. 23—The Los Angeles Speedway Association yesterday closed a contract with G. P. Robinson, a Los Angeles engineer, to run the preliminary surveys on the 300-acre

tract near Bell Station, recently purchased by the corporation for the purpose of building a speedway. The engineer is to establish levels and grade lines at every 100 ft. for the use of the contractor who is to be in charge of the construction work. The contracting engineer will probably be George H. Shank of Chicago, who is now in Los Angeles making his headquarters at the offices of the speedway corporation.

Chicago Clubs in Reliability

CHICAGO, ILL., Sept. 23—The fall Interclub reliability team match between the Chicago Athletic Association, Chicago Automobile Club and the South Shore Country Club to Joliet and return, yesterday resulted in a division of honors between the C. A. A. and C. A. C. The Chicago Athletic Association won the Mayor's cup, which went to the team having the lowest total amount of penalizations, while the Frank X. Mudd trophy, offered the team having the greatest number of perfect scores, was won by the Chicago Automobile Club. The South Shore Country Club had only two of its members penalized, but one of them accumulated a total of 248 points.

8000 at Los Angeles Show

LOS ANGELES, CAL., Sept. 23—The attendance at the automobile show staged at the Shrine Auditorium here, under the management of Walter Hempel, has shattered all records. There were 1400 machines parked outside the auditorium on opening night and the attendance was figured at 8000. Upon an average, 5000 visitors have attended the show each night.

Brand Co. Has Pierce in Ohio

CLEVELAND, OHIO, Sept. 28—Pierce-Arrow cars and trucks will be handled exclusively in Cleveland and adjacent counties in Ohio by the Fred P. Brand Motor Co. Mr. Brand assumed full ownership and charge of the business last week and already has under way extensive plans in forming a progressive selling campaign. The new company will inaugurate a service station.

County Sales Tour a Success

CHAMPAIGN, ILL., Sept. 25—The Champaign County Automobile Trade Association gave a show tour through the county on Wednesday and Thursday, Sept. 29 and 30. Thirty 1916 models comprised the caravan accompanied by as many salesmen. A few minutes was spent at each place and it is believed that the tour will prove effective in interesting the people of the smaller cities in automobiles and increase the number of sales. It is planned to make these tours twice a year hereafter.

Sales Feature Show at Springfield, Ill.

Despite Rain, Cold Weather and Other Handicaps Dealers Did Well

SPRINGFIELD, ILL., Sept. 24—Political aspirations of Illinois gubernatorial candidates compensated to a certain degree for lack of a certain class of attendants at the Illinois State fair by reason of the hoof and mouth disease epidemic which kept so many from the farming districts away. The fair which began Sept. 17 had two days of rain, one day church session, two days of cold weather and finally on the sixth day of a nine-day event an attendance which broke any record for a number of years, brought many to the extensive automobile exhibit, and resulted in many sales and good prospects for future sales.

Automobile exhibitors at the fair are almost unanimous in the opinion that the present method of exhibiting cars is antiquated and loses much of its value through their being scattered about the grounds and sandwiched in between other exhibits of every description. They believe that something should be done to segregate the car exhibits where for purposes of comparison as to finish and detail of construction examination may be more readily accomplished by persons interested. The success of the Milwaukee show last week virtually has been shouted from the house tops; at least it has been heard by exhibitors at the Illinois State fair and considerable comment has been heard, which may result in similar action next year here.

Good Year for Farmers

It is interesting to note the wide range of opinion expressed as to the benefit to be derived from exhibiting cars at the fair, especially this year. Dealers, who have been taking their new models to the fair show for the last six or seven years, find conditions changing every year and many of them look upon the material reductions in prices as a controlling factor in selling the farmer a car. Several dealers expressed the opinion that inasmuch as the farmer's money comes more slowly than that of the city buyer, he naturally spends it somewhat more conservatively and for that reason becomes a more ready purchaser this year since he appreciates that he is getting as good if not a better car for less money than he could have done previously.

One thing more noticeably evidenced this year than heretofore is the fact that the farmer has graduated from the low to the medium priced car, in other words those selling from \$1,000 to \$1,500. Careful survey of the various exhibits de-

velops the fact that fully one-third of the cars shown have been sold on the spot, and before the end of the fair it is likely dealers will have very few cars to take out of the grounds. Several times to-day persons were heard to inquire if they might have certain exhibited cars immediately, or when the fair was over.

Much interest was shown in the farm tractor demonstrations held at intervals in a field adjacent to the grounds. The International Harvester Co. demonstrated its tractors issuing pass-out checks to all those who wished to go out of the grounds to watch the plowing.

Many New Agencies

Many new agents have been appointed during the week and some exhibitors have arranged for enough demonstrations to keep them busy for several weeks. Incidentally it might be said that these demonstrations are not confined exclusively to Illinois, one dealer in particular having arranged demonstrations in four adjoining States.

Barnes Resigns from Overland

TOLEDO, OHIO, Sept. 25—Claire L. Barnes has resigned from the Willys-Overland Co., Toledo, after having spent two years of special work for which President Willys engaged him. His resignation is to take effect Jan. 1. Mr. Barnes' knowledge of the material and parts business gave him an opportunity in securing favorable prices and satisfactory deliveries of materials for the various Willys plants.

Kirk Opens Toledo Office

TOLEDO, OHIO, Sept. 25—Ezra E. Kirk has re-entered the automobile field by becoming a manufacturers' distributor with offices at 719-725 Jefferson Avenue, this city. He will handle a number of lines for automobile parts and accessories makers who are seeking representation in the Middle West section.

Hutchinson Returns to Hupp

DETROIT, MICH., Sept. 25—O. C. Hutchinson, in charge of distribution in the East for the Hupp Motor Car Co., has returned to Detroit, where he will have charge of Hupmobile branches and other duties. V. C. Scriven succeeds him, heading the Hupp Motor Car Co. of New York.

Kansas City Dealers' Tour Oct. 11-16

KANSAS CITY, MO., Sept. 24—The Automobile Dealers' Association of Kansas City has arranged for its annual trade tour, to begin from this city on the morning of Oct. 11 and continue until Oct. 16, taking in the leading towns of western and southwestern Missouri and eastern and southeastern Kansas. The association will not undertake to cover

over 500 miles, and will devote 4 or 5 hr. in each city to talking good roads and showing cars. Upwards of forty cars will participate.

Included in the planned itinerary are Warrensburg, Clinton, Appleton City, Nevada, Lamar, Carthage, Webb City, Joplin, Pittsburgh, Ft. Scott, Pleasanton, Ossawatimie, Paola and Olathe.

Chicago Electric Association Disbands

CHICAGO, ILL., Sept. 28—The Electric Garage and Dealers' Association, which was formed a short time ago, was disbanded last night at a meeting held in the hotel Metropole. Soon after the formation of the body, an effort was made to join it to the Chicago Garage Owners' Association as a section but dissension arose. The garage association foresaw a possible change in name being necessary and objected to the electric men coming in as a section, holding they must come in as individual members. The Anderson Electric Car Co. and three others withdrew at the meeting last night and it was voted unanimously to disband and join the Electric Vehicle Association. The funds remaining in the treasury were turned over to charity.

Only 33 Jitneys in Louisville

LOUISVILLE, KY., Sept. 24—Adverse legislation has curtailed the number of jitneys in Louisville. Only thirty-three cars are now being operated on five streets by the Louisville Jitney Bus Co. Back in April when the movement was at its zenith, 300 jitneys were competing with the street cars.

The latter part of April an ordinance was passed by the city council requiring jitney operators to give a \$5,000 indemnity bond, and pay \$10 for annual license for cars with eight passengers, \$20 for cars carrying eight to fifteen passengers, and \$25 for larger cars. The above licenses are not in lieu of other licenses already required.

The new ordinance drove practically all of the operators out of business, when it was enforced about a month later. The Louisville Jitney Bus Co. was organized and thirty-three cars have been operated ever since by this concern under one \$5,000 bond.

\$100,000 N. J. Jitney Co. Formed

JERSEY CITY, N. J., Sept. 24—Articles of incorporation of the Auto Hack Co., this city, have been filed. The company has a capital of \$100,000 and will start business Oct. 1 with five seven-passenger cars, which will run in Bergen Avenue and Montgomery Street to the Pennsylvania ferry. The company intends to do a jitney business.

Jitneys Win Fight in Richmond

\$500 Bond Ordinance Repealed and Cars Resume a 5-Cent Service

RICHMOND, VA., Sept. 27—After a legal fight which started in the police court and terminated in the Virginia Supreme Court, in which the city of Richmond was sustained in its fight to place an indemnity bond of \$500 on each car thus engaged, Richmond is again enjoying jitney service, though the number of cars is not as great as heretofore because of the high cost of gasoline.

After the city was sustained in upholding its ordinance, citizens of the West End held a mass meeting and urged the City Council to give the jitneys new life. The fight was carried into the Council chamber, and as a result the ordinance was repealed. Mayor George Ainslie signed the repeal papers, and on Wednesday the 5-cent fare cars began regular service. The jitneys are regulated as to the number of passengers they shall carry—no passenger being allowed on the running boards on the doors of the cars. The regulations as to routes are being adhered to and all of the city regulations are being recognized.

The Motor Transit Corp., a subsidiary of the Virginia Railway & Power Co., which put on about forty cars, withdrew the same from service after the independents had been driven to cover because of adverse legislation, and announced that its losses had been about \$700 per month besides the wear and tear. The Motor Transit Corp. will not put back the jitneys, but will continue the operation of several large motor buses as feeders for the street cars. It is probable that later transfers will be given from the motor buses to the street cars operating in opposite directions.

Montreal's Jitneys Vanish

MONTREAL, QUE., Sept. 27—Montreal's jitney service has passed away quietly after a fitful existence of about two months. Started in the middle of April, they enjoyed a fair measure of success at the start, but the service was gradually decreased, and was finally dropped in the middle of July when the Jitney Association of Montreal suspended its operations. The chief cause for the failure of the innovation, as given by one of the promoters of the Association, was lack of co-operation and discipline on the part of the drivers.

Jitney Insurance Exchange Enters Field

KANSAS CITY, MO., Sept. 23—The National Indemnity Exchange, insuring jitneys and livery cars, has been licensed

in Missouri, Oklahoma and Minnesota, and is writing an especially long line in the last-named State. Application is now being made in Arkansas, where it is said many jitney owners wish insurance, and California and Pennsylvania will be entered next. Recently the company received a communication from a jitney organization in New Orleans urging it to enter that city, but Louisiana has no laws under which an interinsurance concern could be licensed. The same situation prevails in Texas. Hundreds of cities have jitneys now which will be eliminated from the streets upon the enforcement of ordinances requiring heavy bond, and in other cities similar present legislation operates against the entrance of the insurance company.

Holds Jitney Ordinance Illegal

BALTIMORE, MD., Sept. 25—The city ordinance placing an annual tax of \$25 per seat on jitney buses has been held to be illegal by Judge Elliott in the Circuit Court, Part 2, on the grounds that the law is discriminatory and prohibitory. The decision is a real victory for the jitney owners. It is probable that the city will take an appeal in the case or that the city council will be called upon to pass another ordinance regulating jitneys.

The Public Service Commission and members of the Automobile Commissioner's force will hold a conference next week at which time they will talk over plans to enforce the rule handed down by the commission which prohibits the overloading of jitneys.

Special License for Solid Tires

BALTIMORE, MD., Sept. 25—City Engineer McCay, of Baltimore, has given until Oct. 1 for owners of solid tired motor trucks to take out the special license for these vehicles.

Jitneys Decrease in Washington

WASHINGTON, D. C., Sept. 25—Since the jitneys were placed under the jurisdiction of the Public Utilities Commission the number of machines in use has decreased from sixty to thirty. Eight companies and individuals are now operating jitney buses here. Within the last month two companies operating buses have had financial difficulties and one of these companies has suspended operations because its machines were seized for non-payment of the purchase price. Aside from putting them under the control of the Public Utilities Commission there has been no legislation here affecting the jitneys.

A license fee of \$12 is required for each machine carrying ten or more passengers and \$6 for each machine carrying under that number. In addition a personal tax of 1½ per cent of the assessed value of each machine is levied.

Factory Miscellany

Selden Starts Addition—The Selden Motor Vehicle Co., Rochester, N. Y., is excavating for an addition to its plant on Probert Street.

To Make Spring Starters—G. L. Rock's spring starter will be manufactured in Jonesville, Mich. A building formerly used for automobile assembling will be used.

Falls Rubber Plant Ready—The Falls Rubber Co.'s plant in Cuyahoga Falls, Ohio, is nearly ready for operation. The new machinery has arrived and is being installed.

Remington Buys Vaughan Plant—The Remington Motor Co. has bought the plant formerly occupied by the Vaughan Motor Car Co., Kingston, N. Y. This plant has been idle for two years.

New Paige Addition—A building permit was obtained to-day by the Paige-Detroit Motor Car Co., Detroit, Mich., for a four-story addition, 312 by 60 ft., the cost being estimated at \$61,500.

To Erect Plant—The E. E. Wentworth Corp. of Maine, that has the entire distribution of Overland cars for the State, is to erect a big plant at Springvale for the manufacture of cars, bodies, etc. It will cost \$50,000.

To Make Signals—The Sherman-Crane Automobile and Signal Co., Denver, Col., manufacturer of automobile direction signals, has written to the St. Paul Association of Commerce regarding a proposed site in the Midway district. The company is capitalized at \$100,000.

Studebaker to Build Testing Track—

The Studebaker Corp. has effected a lease for a large tract of river frontage, directly across from plant No. 3. This is to be used as a testing park for Studebaker cars as they come out of the factory. The corporation will build a track on the grounds.

To Make Automobile Hardware—The Keeler Brass Co., Grand Rapids, Mich., makers of automobile hardware, metal specialties, etc., will immediately commence the construction of an addition to its plant, 150 by 200 ft., to be used for cutting operations with punch presses and automatic screw machines.

Seattle Co. to Build—The Western Automobile Co., Seattle, Wash., has been incorporated with \$1,000,000 capital stock, by C. A. Cawley, G. L. Grant and S. L. North. The company has acquired a factory at Rainier Avenue and Lane Street, Seattle, and will establish an assembling plant and machine shop.

Firestone Foremen Hold Outing—Sept. 18, foremen, superintendents and officials of the Firestone Tire and Rubber Co., Akron, Ohio, to the number of 200 motored 60 miles to the old Firestone Homestead at Columbiana, Ohio, where they spent the day as the guests of President H. S. Firestone. It was the third annual Homestead Outing.

Lakey Foundry to Enlarge—At a meeting of the directors of the Lakey Foundry Co., Muskegon, Mich., it was decided to enlarge the plant and double the number of men employed. The foundry now occupies 25,400 sq. ft. of

floor space and when the additions are completed the floor space will be 43,600 sq. ft., while the working force will be increased from 200 to 400.

Sphinx Ships Delivery—The Sphinx Motor Car Co., York, Pa., which recently made the announcement of putting on the market a light-weight delivery car, shipped the first car from the factory this week. The car sells for \$695, the same price as the touring car manufactured by the Sphinx company. It is of 1000 lb. capacity and is equipped with an electric lighting system and self starter. Increased shipments of Sphinx cars are being made from the factory.

No Homes for Muskegon Workmen—Like Flint, Pontiac and other Michigan automobile manufacturing centers, Muskegon, Mich., is now facing the serious problem of being able to house all its workers. When the additions to the Continental Motor Mfg. Co.'s plant will be finished, 1200 more men will be employed. Several other plants, such as the Campbell, Wyant & Cannon Foundry Co., the Lakey Foundry Co., the Muskegon Motor Specialty Co., will add several hundred men to their forces, although there are hardly any houses for rent now. One real estate company which had sixty-three homes for sale two months ago now has only four unsold, and another which had more than thirty now has none. There is talk of getting city officials and leading citizens together to organize a corporation with a capital of possibly \$100,000 for the purpose of building several hundred houses at once.

The Automobile Calendar

Sept. 26-Oct. 10...Denver, Col., Show, International Soil Products Exposition. Automobile Trades Assn. of Colorado.
Sept. 27-Oct. 3...Salem, Ore., Show, State Fair.
Oct.Dallas, Tex., Show, Dallas Automobile Dealers' Assn.
Oct. 18-25...Los Angeles, Cal., Broadway Automobile and Flower Show, Automobile Dealers' Assn.
Oct. 1-2...Trenton, N. J., Track Races; Inter-State Fair.
Oct. 2...New York City, Sheephead Bay Motor Speedway 350-Mile Race.
Oct. 2...Fresno, Cal., 150-Mile Race, District Fair, Fresno County Agricultural Assn., C. G. Eberhard.
Oct. 2-9...Cincinnati, Ohio, Show, Music Hall, Cincinnati Automobile Dealers' Assn.
Oct. 4-10...St. Louis, Mo., Show, Forest Park Highlands, St. Louis Automobile Manufacturers and Dealers' Assn.
Oct. 4, 5, 6...Columbus, O., Garage Owners' Convention.

Oct. 4-14...Wichita, Kan., Show, Wichita Auto. Dealers' Assn.
Oct. 6-16...New York City, Ninth Electrical Exposition and Motor Show at Grand Central Palace.
Oct. 9...Indianapolis, Ind., 100-Mile Invitation Race, Motor Speedway.
Oct. 11-12...Dayton, O., National Paving Brick Manufacturers' Assn., Annual Meeting.
Oct. 14...Chicago S. A. E. Standards Committee Meeting.
Oct. 16...Chicago, Ill., 350-Mile Race, Chicago Speedway.
Oct. 16-23...Pittsburgh, Pa., Show, Motor Square Garden, Automobile Dealers' Assn.
Oct. 17...Twin City Speedway Match Race.
Oct. 18-19...Cleveland, O., Hotel Statler, Sixth Annual Convention, Electric Vehicle Assn. of America.
Oct. 18-24...Troy, N. Y., Show, State Armory, Troy Automobile Dealer's Assn.
Oct. 20-21-22...Excelsior Springs, Mo., National Assn. of Automobile Accessory Jobbers' Meeting.

Oct. 24...Fort Worth, Texas, Race Meet.
Nov. 1-3...Pasadena, Cal., Show, Hotel Green, Walter Hempel.
Nov. 12-20...Providence, R. I., Show, State Armory, Rhode Island Automobile Dealers' Assn.
Nov. 18...Arizona 150-mile Grand Prix.
Nov. 29-Dec. 4...Electric Prosperity Week.
Dec. 31...New York City Show, Grand Central Palace.
Jan. 8-15...Philadelphia, Pa., Philadelphia Auto. Trade Assn.
Jan. 22, 1916...Chicago, Ill., Show; Coliseum.
Jan. 24-29...Buffalo, N. Y., Show, Buffalo Automobile Dealers' Assn., Broadway Auditorium.
Jan. 29-Feb.Minneapolis, Minn., Show, National Guard Armory, Minneapolis Trade Assn.
Feb. 7-12...Kansas City, Mo., Show, Convention Hall, Kansas City Motor Dealers' Assn.
Feb. 15-20...Omaha, Neb., Show, Omaha Automobile Show Assn.
Feb. 19...Newark, N. J., Show.
March 4-11...Boston, Mass., Truck Show, Mechanics Bldg.

The Week in the Industry



Watson a Service Head—The Kent Motors Corp., New York City, distributor for the Abbott and Marion, has appointed William Watson superintendent of service.

Hobert Handling Master Carbureter—T. R. Hobert, formerly with the Peerless Motor Car Co., Cleveland, is now handling the Master carbureter in St. Louis, headquarters being at 5205 Delmar Avenue.

Wickham Resigns from Minneapolis Studebaker—F. A. Wickham has resigned his position with the Minneapolis branch of the Studebaker Corp., having been with it for more than five years. He is planning organizing a company to handle tires.

Barnett King Factory Rep.—I. S. Barnett, until three weeks ago president of the Kentucky Automobile Co., Louisville, Ky., Cadillac dealer, has been appointed factory representative of the King in Kentucky and southern Indiana, with headquarters in Louisville.

Recent Haynes Appointments—J. C. Tegder has been made assistant sales manager of the Southern department of the Haynes Automobile Co., with headquarters at Atlanta, Ga. F. B. Cornell and Harry Chalfant have been appointed district representative and service department head, respectively, with headquarters at Atlanta.

Smith in Charge—G. A. Smith has been detailed by the Ford Motor Co. to take charge of the service and repair departments of the Everyman's Car Co., corner of Sparks and Kent Streets, Ottawa, Ont. The latter has been delegated the exclusive right to sell Ford cars in Ottawa with sub-dealers at Vankleek Hill, Russell, North Gower, Casselman and Aylmer. Its big new plant is now in operation.

Dealer

Louisville Co. Adds White—The Callahan Motors Co., 811 South Third Street, Louisville, Ky., agent for the Scripps-Booth and Chandler cars, has acquired the agency for the White in the Louisville territory.

Mitchell in Salt Lake City—The Meredith Automobile Co., Salt Lake City, Utah, has taken on the Mitchell. The company is located at 65 West Fourth South Street. J. B. Hamby is sales manager. The company has taken on the distribution for Utah, Idaho and Wyoming.

Motor Men in New Roles

Beltzig Firestone Office Mgr.—E. H. Beltzig has been appointed office manager of the St. Louis branch of the Firestone Tire & Rubber Co., Akron, Ohio.

Shetter Heads York Co.—The Penn Auto Co. has opened sales rooms at 31 West Philadelphia Street, York, Pa. G. W. Shetter is the manager of the new company.

Yancey a Manager—L. T. Yancey of St. Louis, has been appointed manager of the service department of the Columbia, Mo., branch of the Hudson-Phillips Motor Car Co.

Oswald Heads Louisville Co.—The Reliable Double Tread Tire Co. has opened an office and workshop at 907 West Broadway, Louisville, Ky. J. F. Oswald is the new manager.

Cooper Goes to Topeka—J. R. Cooper, formerly factory representative of the Overland at Kansas City, has been made manager of the truck department of the Overland at Topeka, Kan.

Curtain Resigns—T. E. Curtain has resigned as sales manager of the Columbus Cadillac Co., Columbus, Ohio, to engage in business for himself. His plans for the future have not yet been made public.

Ranney Heads Seattle Willard—The Storage Battery Service Co. of 1532 Broadway, Seattle, Wash., has been appointed agent and service station in Seattle and surrounding territory for the Willard storage battery. L. J. Ranney is manager of the firm.

Fisher Retires—R. T. Fisher has retired from the Campbell-Fisher Sales Co., Columbus, Ohio, Madison distributor, and will devote his time to other interests. H. B. Gilchrist, vice-president of the company, will assume the duties of secretary and treasurer.

Thomas Resigns from Moline—J. V. Thomas, who has been associated with the sales department of the Moline Automobile Co., East Moline, Ill., for the past year, has resigned. He will be succeeded by D. M. Beal, who has been manager of the branch in Omaha.

Campion Handles Swinehart Tire—Ed Campion, former sales manager of the Marathon Tire & Rubber Co., Cuyahoga Falls, Ohio, and former manager of the Seattle branch of the Firestone Tire & Rubber Co., has opened a distributing house for Swinehart tires in Seattle. His territory embraces the States of Washington, Oregon, Idaho and Mon-

tana and the Canadian province of British Columbia. Campion's store is located at 909 East Pike Street.

Returns to Ranney Staff—W. H. Van Deusen, formerly in charge of the wholesale department of the A. Elliott Ranney Co., New York City, and since June wholesale manager for the Carl H. Page Motors Co., is again associated with the Ranney company in charge of the wholesale distribution of King cars.

Patten Succeeded by Buse—R. H. Patten has resigned his office as vice-president and general manager of the Buse-Patten Motor Car Co., Buffalo, N. Y. Gustave Buse will succeed him in the management of the company which distributes Grant, Hupmobile, National and Moon cars in Western New York.

Foss Pierce Commercial Mgr.—W. J. Foss has been appointed commercial manager of the Pierce-Arrow Motor Car Co., Buffalo, N. Y. Mr. Foss has been associated with that company for the last 10 years as treasurer of the Foss-Hughes Co., distributor of that car in Philadelphia, Baltimore, Washington, Wilmington, Providence and Newport.

Guyon Joins Elyria Co.—F. R. Guyon has left the American Ball Bearing Co. to become assistant manager of sales of the Elyria Iron and Steel Co. The executive offices of the Elyria concern have recently been moved to Cleveland.

Dealer

Master Carbureter in Cincinnati—The Carbureter Sales Co. has been organized in Cincinnati, Ohio, by C. Shuster and Edward Voss, Jr., to handle the Master carbureters. Headquarters have been opened at Court and Elm Streets.

Packard Service Bldg. in Chicago—An addition is planned for the Packard Motor Co. of Chicago. The new structure will cost \$125,000 and is located at 2338-42 Indiana Avenue, just north and in the rear of the present property at Michigan Avenue and 24th Street. It will be completed by Jan. 1. Fireproof construction will be utilized on the five-story service station. It is to have a frontage on Indiana Avenue of 78½ ft. and will be 160½ ft. deep.

To Make Tires—The Huntington Tire & Rubber Co., Huntington, W. Va., capitalized at \$25,000, will make automobile tires in that city. The plant will have a capacity of fifty tires a day. The incorporators are F. M. Bailey, J. F. Schmidlapp, J. M. Thornburgh, P. M. Walker and Roy Bailey.

New Garage for Canton—Oscar Sogan and J. C. Opperud have bought the White Front garage at Canton, S. D., from Elling Ellingson.

Ward Makes N. Y. Lease—The Ward Motor Vehicle Co., New York City, has leased a store and basement at 1838 Broadway, New York City.

Handles Gray & Davis Line—Jenkins & Robinson, proprietors of the Blue Ribbon Garage, at 69 Central Street, Worcester, Mass., have been appointed representatives for the Gray & Davis equipment and a service station has been installed.

First Municipal Garage in Texas—The first municipal garage ever established in Texas, is located at Dallas. It is in charge of chief mechanic G. L. Vaughan. It is fully equipped for the work and was established only a few weeks ago.

John & Arthur Moves—The John & Arthur Co., one of the biggest accessory houses at Boston, Mass., has been forced to vacate its salesrooms at 117 Massachusetts Avenue because it has outgrown them, and it will be located at 165 Massachusetts Avenue shortly after Oct. 1.

Pope Parts Service in Mass.—Owners of Pope-Hartford cars in Massachusetts and the northern New England States are to be taken care of in the matter of new parts by the Pope-Hartford Co. of Boston, which in the future will carry a complete line for the various models.

The Hartford Motor Car Co., Hartford, Conn., is enlarging the parts plant and is going into the manufacture of all parts for these cars on a larger scale than ever before.

New Stations Completed—The new service stations under construction at Springfield, Mass., one at Winchester Square for the Corson-Berry Co., agent for the Studebaker, and the other at 600 State Street for M. G. Barrett, who has the Metz line, have been completed.

Maguire to Build—J. W. Maguire, who has sold the Pierce-Arrow at Boston, Mass. for years, has petitioned the city authorities to grant him a permit to build a service station at 1061 Commonwealth Avenue, right beside the structure now owned by the Packard Motor Car Co.

Packard Buys Land in Cleveland—The Packard Company will build a \$125,000 fireproof structure running from Prospect Avenue, S. E., to Carnegie Avenue, Cleveland, Ohio, to be used as an agency. The building will be two stories with a 98-ft. frontage on Prospect Avenue, and a 322-ft. depth.

Baltimore Trade News—The Double Mileage Tire Co., Inc., of Buffalo, N. Y., has opened a branch at 533 North Howard Street, Baltimore. It is said that

other branches will be opened in other parts of Maryland.

The new headquarters of the Baltimore Buggy Top Co., 107 West Mount Royal Avenue, Baltimore, have been formally opened. H. D. Coulson is in charge.

The Wayne Oil Tank & Pump Co., North Avenue near Linden Avenue, now is handling the products of the company of Fort Wayne, Ind. The members of the local agency are H. Winternitz, Jr., and M. J. Gutman.

The Beehler & Ogden Motor Company, Lexington Street, near Carey Street, has taken the agency of the Allen cars.

Colorado Trade News—J. A. Nisbet, who recently secured the Scripps-Booth agency for Colorado, has moved into permanent quarters at 1551 Broadway, Denver.

A. C. Friedman has started a plant for making over old tires at 1241 Broadway, Denver, under the business name of the Western Double Tread Tire Co.

The Platt-Fawcett Motor Co., 1249 Broadway, Denver, Stearns and Mitchell distributor, has taken the State agency for the Paige, which was recently given up by Lester G. Palmer.

George Stroeble Sons, Idaho Springs, Col., are planning to build a garage next month. The building will be 60 by 110 ft., and will be arranged for an accessory display. C. K. Miller, at present in charge of the automobile work machine shop, will be manager of the new garage.

Late Ill. Trade News—Donald Joy has taken the agency for the McFarlan car for Morgan and adjoining counties in Illinois, and will make Jacksonville the distributing point.

J. B. Harris of 116 East Washington Street, Springfield, has taken the agency for the National car.

Naffziger & Holderly of Minier, Ill., have taken the agency for the Argo.

The Frank H. Cole Motor Car Co. has outgrown its present quarters at 217 East Front Street, Bloomington, Ill., and has leased the double building of two stories, now occupied by the Bloomington Motor Co., distributor for the Ford car. The latter company is completing a large, fireproof building of three stories at 305-11 West Jefferson Street and, as soon as possession is taken of the new structure, the Cole company will move into the one vacated. The changes will be made about Oct. 1.

Late St. Louis Items—The George C. Brinkman Motor Car Co., 2818 Locust St., St. Louis, Mo., has been appointed distributor of the King line in the St. Louis district, including the eastern half of Missouri and the southern half of Illinois.

The Illmo Motor Mdse. Co. has moved into its new quarters at 1174-76 North Kingshighway, where it will handle Michelin tires and a full line of oils, accessories and supplies and is equipped with a complete vulcanizing plant. H. F. Goudy is manager.

The Independent Tire Co., 3150 Locust Street, St. Louis, Mo., will triple its space in the near future. The company has leased the building at 3152 Locust Street recently vacated by the Koochook Rubber Co.

The Missouri Auto Specialty Co. has doubled its sales room space and service capacity by moving into its newly equipped building at 1903-1905 Locust Street.

Philadelphia Automobile Agencies Combine—The Stearns Motor Car Co. of Philadelphia and the Eveland Motor Car Co. have been consolidated under the firm name of the Yerkes-Eveland Co., to handle the Stevens-Duryea account, the Stearns-Knight and the Stewart truck. For the present the locations of the two organizations will remain as heretofore, namely on Ridge Avenue above Broad Street for the Eveland company, and the northeast corner of Broad and Mount Vernon Streets for the Stearns. The main offices will be at the latter location and the main service station at the first-named address. Plans are under consideration, however, to merge the two establishments at one location, the truck department to be conducted separately under H. C. Minor. Officers of the new concern are: William C. Yerkes, formerly of the Stearns company, president, and Winsor Eveland, formerly of the Eveland Motor Co., vice-president and general manager.

Toledo's New Garage—What is said to be the most modern, most completely equipped and one of the largest garages in the Middle West is the new home of the United Garage at the corner of Jefferson Avenue and Ontario Street, Toledo, Ohio. The new home contains 60,000 sq. ft. of floor space and occupies the five-story and basement structure formerly known as Burt's Theatre. The building has been completely remodeled and rebuilt. The building is constructed of brick and concrete and is equipped with automatic sprinkler system and automatic fire alarm. Among the other modern features of the garage are rest and retiring rooms for ladies, shower baths for tourists, electric elevators of the largest size, that travel 60 ft. a minute, tire-inflating service to every foot of space in the entire structure, equipment to wash two cars at once in the shortest possible time, a service and repair department that will overhaul a car in a few hours' time, so that tourists will not be delayed, and special road and travel information bureau.

Recent Incorporations in the Automobile Field

Canada

HAMILTON, ONT.—East End Garage Co., \$40,000. F. A. Robertson, C. R. Robertson, G. S. Dunkin.
 OTTAWA, ONT.—Auto Products Co., \$250,000. W. J. Halpin, P. J. Daly, L. R. O'Connell.
 OTTAWA, ONT.—Everyman Car Co., \$40,000. A. M. Jacques, F. H. Jacques, C. A. Jacques, J. W. Nicoll, R. I. Schram.
 VANCOUVER, B. C.—Ford Lock Co., \$25,000; maker. B. P. Youmans, J. M. Hoff, G. B. Simpson.

Colorado

DENVER—Auto Sales Co., \$25,000. H. W. Curtis, J. A. Davis, D. C. Triggs.

Delaware

WILMINGTON—Motor Transit Co., \$600,000. F. S. Coleman, H. B. Lanyon, H. E. Latter.

Georgia

ATLANTA—Compression Inner Tube Co., \$10,000. S. A. Culbertson.

Illinois

CHICAGO—Boulevard Tire and Supply Stores, \$10,000. Jesse Spalding, A. T. Carton, H. A. Gardner.
 CHICAGO—National Carburetor Co., \$5,000. W. P. Habel, W. A. Edward, C. G. Lamb, W. H. Williams.
 CHICAGO—Safety Ford Starter Co., \$2,500. W. J. Montgomery, S. B. Krohn, H. D. Gibbons.
 MARSHALL—Marshall Motor Co., \$2,500. Albert Sockler, Bertha Sockler, A. L. Ruffner.

Indiana

AUBURN—Dekalb Mfg. Co., \$150,000; automobile manufacturer. W. J. Vesey, A. J. Vesey, W. J. Vesey, Jr.
 EVANSVILLE—Saunders Auto Co., \$2,000. J. F. George, R. Saunders.
 EVANSVILLE—Day Motor Car Co., \$10,000. E. F. Day, O. S. Meeks, Jr., F. L. Schumpert, Jr.
 INDIANAPOLIS—Shade-O-Lite Co., \$25,000; to make dimming devices. F. W. Beauchamp, C. H. Thompson, R. F. Davidson.
 INDIANAPOLIS—Zeglen Tire and Fabric Co., \$50,000. Casimer Zeglen, F. I. Hardy, E. R. Dean.
 INDIANAPOLIS—Indiana Bull Tractor Co., \$5,000. T. F. Moorman, L. F. Moorman, R. H. Greene.
 SOUTH BEND—No-Leak Rubber Tire & Tube Co., \$12,000. F. J. Cosgrove, F. A. Hull, B. J. Engledrum.
 SOUTH BEND—Indiana Auto Sales Co., \$10,000. H. L. Simonton, H. H. Albert, E. J. Engstrom.
 SOUTH BEND—Zeglen Tire and Fabric Co., \$50,000; rubber and fabric products. C. Zeglen, E. R. Dean, F. I. Hardy.

Kentucky

GEORGETOWN—Prather Demountable Wheel Co., \$40,000. M. B. Ainsworth, J. C. Prather, A. P. Prather, Oklahoma Prather.
 GLASGOW—Dickinson Bros. Motor Co., \$12,000 to \$20,000.
 LOUISVILLE—The Lee Tire Sales Co., \$10,000. W. G. Stiglitz, Louis Stiglitz and Herbert Rudolph.
 OWENSBORO—Owensboro Motor Car Co., \$4,500. O. C. Williams, R. P. Keene, Lee Hart.

Massachusetts

MALDEN—Parks-Osgood Co., \$25,000; automobile maker. Howard Osgood, G. A. Parks, P. M. Foss.

Michigan

DETROIT—Michigan Auto Top & Painting Co., \$25,000. H. E. Bullen, C. D. Girard, E. E. Pratt, W. J. Hoskins.
 DETROIT—Detroit Auto Accessory Co., \$2,000. J. C. Beck, T. A. Ballinger, O. C. Hull.
 DETROIT—Federal Brass Works, \$50,000. C. R. Murphy, S. C. Reynolds, F. A. Behr.
 DETROIT—Gasolock Sales Co., \$5,000. C. R. Chisholm, R. G. Clark, R. B. Johnston.
 DETROIT—Detroit Motor Appliance Co., \$45,000. W. E. Carpenter, H. R. Crawford, H. R. Lewis.
 DETROIT—Century Mfg. Co., \$40,000; vehicle manufacturer. Edwin Denby, Philip Breitmeyer, John Gillispie, W. P. Pagel.
 DETROIT—Standard Auto Co., \$50,000. E. S. George, A. H. George, W. S. Stebens.
 DETROIT—West Detroit Auto Sales Co., \$8,000. C. C. Cook, H. E. Smith, R. A. Snelling, A. B. Wickham.
 DETROIT—Jiffy Starter Co., \$15,000. A. W. Cronk, Henry Fatz, Perce Shekell, R. Wachman.
 DETROIT—Service Truck Co., \$10,000. E. H. Fowler, K. Warren and H. R. Stoepel.
 DETROIT—Auto Service Mfg. Co., \$1,000. E. E. Wasey, C. L. Christie, J. P. Nurdorfer.
 DETROIT—Falcon Motor Truck Co., \$20,000. A. B. Hazzard, O. B. Mallow, F. T. Lodge.
 DETROIT—A. S. C. Co., \$1,500. W. W. Tackabury, J. E. Hamilton and H. E. Avery.
 DETROIT—Hurst Garage Co., \$1,000. H. W. Hurst, A. E. Badge and J. C. Shields.
 DETROIT—H. P. Engineering Co., \$1,000. H. E. and O. A. Peters, E. R. Holmes.

DETROIT—Cole Tire-Protector Co., \$100,000. F. S. Baker, S. M. Cole, H. M. Cole.
 WYANDOTTE—Detroit-Wyandotte Motor Co., \$300,000 to \$100,000.

Minnesota

MINNEAPOLIS—Twin City Cord Tire Co., \$50,000. C. A. Ennis, M. A. Hesslan, C. L. Archer.

Missouri

JEFFERSON CITY—Battery Service Co. of St. Louis, \$3,000. W. O'Shure, M. J. Cline, E. B. Jennings.
 JEFFERSON CITY—The Motor Transportation Co. of St. Louis, \$10,000. H. C. Stifel, R. A. Huber, N. C. Hadley.
 ST. LOUIS—Velle Automobile Co., \$7,500. H. L. Schure, A. Steiner, W. L. Hausman.
 ST. LOUIS—H. Bender Tire Co., \$2,000. S. Vazis, H. W. Killersman, C. F. Mieke.
 ST. LOUIS—H. S. H. Mfg. Co., \$10,000; maker of radiator caps. P. G. Hoffman, H. A. Hood, Garrard Strode.

New Jersey

NEWARK—Self Vulcanizing Rubber Co., \$25,000.
 NEWARK—Empire Mfg. Co., \$25,000; spark plug maker. J. L. Cobb, F. J. Miles, W. P. Murphy.

New York

BROOKLYN—Delling Auto Co., \$10,000; dealer. J. A. Lederman, B. I. Lockwood, M. M. Salomon.
 BUFFALO—Transmission Ball Bearing Co., \$100,000; maker. W. J. Murray, J. P. Beatty, W. M. Wilson.
 BUFFALO—Derrick, Gannon Motor Sales Co., \$10,000. R. L. Derrick, F. T. Gannon, J. G. Lesawing.
 ROCHESTER—Double Mileage Tire Co., \$10,000; manufacturer. F. L. McCausland, Warren Bulkeley, J. Mahker, 319 Electric Avenue.
 ROCHESTER—Big Six Auto Livery Co., \$25,000. J. Rodenbecker, C. J. Trumeter, C. R. Bradley.
 UTICA—R. and V. Motor Co., \$10,000. W. A. Van Wie, J. M. and G. B. Russell.

New York City

Duffy Motors Corp., \$5,000. L. J. Goldman, G. S. Ludlow, S. C. Duffy.
 Lexington Motors New York Corp., \$50,000. F. I. Barrows, A. A. Woodruff, W. S. Fowler.
 O'Toole Motor Renting Service, \$5,000. A. J. J. J. and T. P. O'Toole.
 Utilities Sales Assn., \$5,000; parts. D. Doell, B. Sommer, F. H. Hull.
 United States Auto Service Corp., \$50,000. J. De Barbier, J. Condon, L. Ferger.
 Schuyler Garage & Supply Corp., \$5,000. John Irving, Beatrice Irving, J. F. Ford.
 Westchester Accessories Corp., \$5,000. P. M. Pelletreau, B. J. Wagner, C. H. Ludder.

North Carolina

ACME—Moore and Connor Co., \$10,000; automobiles and accessories. T. V. Moore, D. R. Connor, E. P. Moore.

Ohio

ASHTABULA—Ashtabula Auto Sales Co., \$4,000. G. A. Brockway, G. M. Parker, W. H. Collender, J. C. Moran, M. C. Collender.
 CANTON—Auto Garage and Sales Co., \$10,000. J. H. Boose, E. C. Scheffler, E. N. Swetzer, C. E. Halliwell, A. N. Hurst, R. J. Keeder.
 CINCINNATI—Double Life Tire Co., \$5,000. Harry Frank, Sophie Frank, Louis Goldstein, Julius Loewenstein, Ignatz Stern.
 CLEVELAND—Cleveland-Ford Tire Co., \$10,000 to \$100,000.
 CLEVELAND—Brown Spring Oiler Co., \$10,000. W. H. Brown, B. B. Wickham, D. H. Tilden, W. J. Budd, G. M. Reilly.
 CLEVELAND—Superior 105 Garage Co., \$10,000. A. Frankel, W. G. Cole, H. Jones, Hazel Cole, Florence Frankel.
 CLEVELAND—B. & B. Valve & Motor Co., \$1,000. B. A. Beckett, C. C. Vrooman, C. E. Bellen, H. L. Parmenter.
 CLEVELAND—Cleveland Automobile Show Co., \$7,500. Richard Ingils, R. J. Bulkley, F. X. Cull, I. W. Sharp, M. T. Flanagan.
 COLUMBUS—Columbus Cadillac Co., \$25,000. Morton McGiffin, F. E. Felton, T. B. Bolton, E. S. Jenkins, R. G. Morrison.
 COLUMBUS—Fireproof Garage Co., \$10,000. W. D. Huber, A. C. Huber, A. E. Huber, Olive Swift, J. A. Kever.
 DAYTON—Fireproof Garage Co., \$10,000. W. D. Huber, A. C. Huber, A. E. Huber, O. M. Swift, J. A. Kever.
 FINDLAY—Crofoot Mfg. Co., \$25,000; to make a contrivance for shipping automobiles. E. H. Crofoot, C. L. Casterline, J. E. Fennerty, G. L. Cusack, S. W. Maschoo.
 LIMA—Gramm Motor Truck Co., \$125,000 to \$2,500,000.
 OWENSBORO—Owensboro Motor Car Co., \$4,500. O. C. Williams, R. F. Keene, Lee Hart.
 SALAM—Porter Rubber Co., \$125,000. J. C. Porter, A. H. Boyd, W. F. Church, C. F. Smith, L. P. Metzger.
 SEBRING—Sebring Tire & Rubber Co., \$200,000. John Hotchkiss, W. F. Smith, C. B. Smith, H. D. Weaver, W. B. Stevenson.

TOLEDO—Ohio Tire Service Co., \$1,000. G. W. Henne, M. E. Hubbard, Samuel Lover, J. M. Lover, A. C. Moore.
 TOLEDO—Universal Motor Co., \$100,000. Howard Lewis, H. J. Kehoe, F. S. Lewis, P. W. Alexander, F. W. Gaines.
 TOLEDO—Jonas Battery Co. changed to Toledo Battery Co.
 YOUNGSTOWN—Security Automobile Mutual Insurance Co.; no specified stock; to write automobile insurance. B. E. Cornelius, C. A. Cochran, Phillip Wiel, G. H. Kennedy, E. E. Dennison.

Pennsylvania

ALLEGHTOWN—Allen Street Sweeper & Auto Co., \$10,000; to make trucks and street cleaning apparatus. A. G. Dewalt, 309 North Sixth Street; H. S. F. Barner, J. F. Garman, Henry Krouse, Henry Hantz.

South Dakota

PIERRE—United States Wheel and Tire Co., \$300,000. E. S. Gleasman, S. D. Ross, C. B. Nelson, L. H. Moore, E. G. Hoffman, H. P. Moses, J. R. Atwood, H. M. Wilcox, G. W. Shaw.

Tennessee

MEMPHIS—American Auto Jack Co., \$10,000; maker. J. E. Richards, H. W. Watson, P. H. Pierce and others.

Texas

AMARILLO—Overland Texas Co., \$10,000. T. S. Likine, T. F. Turner, A. S. Rollin.
 AMARILLO—Western Motor Co., \$1,000. C. H. Dixon, W. L. Fore, C. C. Chenoweth.
 DALLAS—Overland Service Corp., \$5,000. T. F. McBriener, E. L. Gaddis, G. E. Mannatt.
 DALLAS—Malff Thomson M. C. Co., \$15,000. G. A. C. Malff, E. J. N. Lanham, R. M. Thomson.
 DENISON—Denison M. C. Co., \$2,500. B. S. Benedict, Frank Platter, W. W. Lankford.
 SAN ANTONIO—Blumberg Motor Mfg. Co., \$25,000; motor maker. H. G. Blumberg.

Virginia

RICHMOND—Armstrong Tire Co., \$10,000; manufacturer. H. H. Chalkley, N. Rutenberg, A. R. Lane.

Washington

EVERETT—Northwest Tire Company, \$2,000. Arthur A. Bailey, James C. Lashua.
 OLYMPIA—Capital Transit & Repair Co., \$2,000. L. J. Meyers, H. H. Schultz, O. A. Schultz.
 SEATTLE—Jacqueline Auto Steel Wire Tire Co., \$100,000. Eugene Jacqueline, Evan Gough, J. R. Cabanne.
 SEATTLE—Bailey Garage & Machine Co., \$20,000. J. W. Bailey, J. F. Seacare.
 SEATTLE—Western Automobile Co., \$1,000,000. C. J. Grant, C. A. Cawley, S. W. North.
 SEATTLE—Hainsworth Motor Co., \$25,000. J. W. Hainsworth, C. L. Hall.
 SEATTLE—N. Foster Co., \$10,000. J. F. LePage, V. S. McKenny, N. H. Foster.
 SPOKANE—Inland Automobile Assn., \$50. T. S. Lane, F. W. Gullbert, H. Weatherspoon.
 SPOKANE—Spokane Motor Transportation Co., \$6,000. Paul, Ralph E. B. Quackenbush.

Wisconsin

APPLETON—The Appleton-Buick Co., \$5,000. M. J. Konrad, F. M. Charlesworth, F. Felix Wettengill.
 ASHLAND—Simple Gas Engine Co., \$10,000. A. L. Feimerberger, C. A. Anderson, W. F. Thommes.
 CEDARBURG—Automobile Jack Co., \$25,000; maker. J. R. Thill, E. J. Broth, M. N. Green.
 EAU CLAIRE—Northwest Wisconsin Overland Co., \$50,000. J. A. Taylor, S. H. Hancock, E. A. Arnold.
 MEDFORD—Medford Automobile Club; non-stock corporation. O. N. Nystrum, C. F. Leupke, E. C. Nystrum, W. H. Newburg, H. M. Koehler.
 MILWAUKEE—Transmission Research Co., \$25,000. A. D. Whipple, F. L. Bader, C. Doerfler.
 MILWAUKEE—Roberson Electric Appliance Co., \$10,000. L. C. Roberson, P. A. Klumb, D. C. Madden.
 MILWAUKEE—Milwaukee Auto Engine & Supply Co., \$6,000 to \$30,000.
 MILWAUKEE—Oil Gas Machine Co., \$25,000. F. J. Blum, H. M. Wink and E. O. Linton.
 MILWAUKEE—Teutonia Avenue Garage Co., \$3,000. A. F. Schunk, A. C. Milbrath and F. R. Wahl.
 MILWAUKEE—Wetmore Mechanical Laboratories Co., \$2,000. C. P. Wetmore, M. J. Walsh, W. C. Sicker.
 MILWAUKEE—Leo Hofmeister Co., \$10,000. Leo Hofmeister, C. M. Waechter, H. B. Kaczynski.
 CEDARBURG—Automatic Jack Co., \$25,000. J. R. Thill, E. J. Groth, M. N. Green.

West Virginia

CLARKSBURG—Harrison County Automobile & Garage Co., \$10,000. G. H. Gordon, R. L. Strother, O. L. McDonald, C. E. Ash, J. S. Blackman.